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ABSTRACT

To explore the economic feasibility of a rural broadband telecommunications system supported by revenues from subscriber, commercial and public service users, a potential demonstration cable system was designed and evaluated for Poinsett County, Arkansas. Analyses of projected capital and operating costs, anaticipated revenues, prospective public service applications, required non-entertainment contributions, and break-even fees and penetration rates were made using the Hopkins Cable Model modified to reflect some specific features of rural systems. The system was designed on the basis of the County's existing utility distribution system. The analytical approach was to: estimate, on the basis of model calculations, the total capital and operating costs of the system over a 10-year period; determine the amount of these costs that can be expected to be covered by subscriber revenues for entertainment uses over the period; and indicate the remaining average annual revenues that would be required to be covered from public service uses, grants, and other sources of non-entertainment revenue for the system to break even. Findings included: a demonstration system in the County would cost around $3,880,000; subscriber fees for entertainment uses were anticipated to yield $1,903,000 in total revenues over the period; and at a $6/month basic subscriber fee, a penetration rate of 74.5% would be necessary to finance the system entirely from entertainment uses. (NQ)

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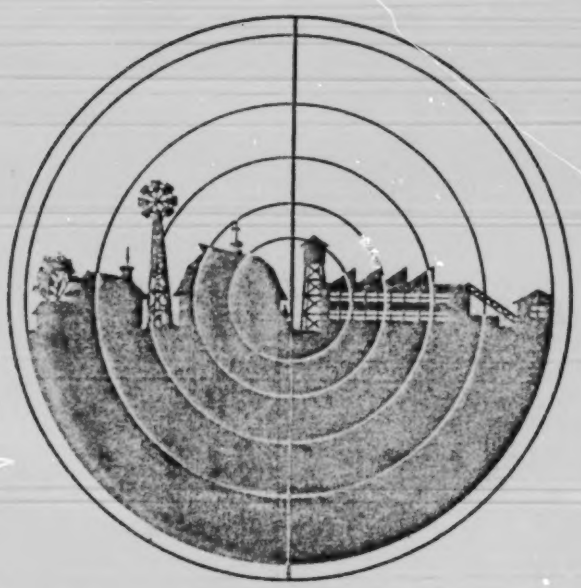

November 15, 16, and 17, 1976

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Communications and Rural America

Purpose

In April 1976, the Office of Technology Assessment (OTA) of the U.S. Congress issued a staff report entitled *The Feasibility and Value of Broadband Communications in Rural Areas*. The purpose of the conference is to extend this effort by:

- Considering a broader range of communications technologies which might be used to meet rural needs.
- Further examining the question of whether system demonstrations aimed at achieving economic viability are needed and if so, identifying the kinds of demonstrations which might be undertaken.
- Further examining whether rural interests have been adequately considered in existing Federal communications policy.

The outcome of this effort will be a report incorporating the information and points of view presented at the conference.

Congressional Interest

The conference is being held in response to a request for additional information on rural communications from Senator Herman Talmadge, Chairman of the Senate Agriculture Committee, as approved by the 12 member Technology Assessment Board of the U.S. Congress. Senator Pastore of the Senate Subcommittee on Communications subsequently joined Senator Talmadge in support of the conference. It is intended that the conference will be of value to the U.S. Congress in its deliberations on communications policy.

Conference Dates and Organization

The conference will convene for 3 days, November 15–17, 1976, with about 60 invited participants. For the first 2 days, participants will be equally divided among three panels which will meet in parallel. Each panel will concentrate upon a specific topic addressed in the OTA report as follows:

- **Panel 1.** Rural Development and Communications.
- **Panel 2.** Technology, Economics, and Services.
- **Panel 3.** Federal Policy.

On the third day, participants from all three panels will meet together to exchange and synthesize findings and explicitly address the question of rural system demonstrations.

Cosponsoring Institutions

The National Rural Center is cosponsoring Panel 1 (Rural Development and Communications). The Aspen Institute is cosponsoring Panel 3 (Federal Policy).

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Design and Evaluation of a Demonstration Rural Telecommunications System for Poinsett County, Arkansas

Submitted by

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117 Cross Keys Road
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To

Office of Technology Assessment
United States Congress
Washington, D.C. 20510

30 September 1976

The work reported here was commissioned by the U.S. Congress, Office of Technology Assessment, expressly for the Conference on Communications and Rural America, Washington, D.C., November 15-17, 1976.

EXECUTIVE SUMMARY

In April 1976, the staff of the Office of Technology Assessment, responding to a request from Senator Herman Talmadge, issued a preliminary evaluation of "The Feasibility and Value of Broadband Communications in Rural Areas" [U.S. Congress, Office of Technology Assessment, Washington, D.C.]. That report offered a survey of the potential uses for telecommunications in rural, less densely settled areas, examining the ways in which telecommunications might reinforce rural development efforts while taking full note of the disappointing use to date of telecommunications to deliver social services in urban settings. In their report, OTA noted:

> ...detailed consideration of a system approach to broadband communications in which costs are shared and revenues are generated by public users, commercial users, and subscriber-supported entertainment fees has not been attempted. However, such a system approach may be the key to an economically viable broadband system which could serve an entire rural community. (p.1-7)

In order to explore in more detail the economic feasibility of a rural broadband telecommunications system supported by revenues from subscriber, commercial, and public service users, OTA selected a prototype rural county for which we have designed and evaluated a potential demonstration cable system. Analyses of projected capital and operating costs, anticipated revenues, prospective public service applications, required non-entertainment contributions, and break-even fees and penetration rates have been made using the Hopkins

Cable Model modified to reflect some specific features of rural systems.*

Selection of the Study Area

Poinsett County, Arkansas, was selected by the research team at OTA as typical of the type of county they have characterized as a "turnaround reversal" situation, that is:

> ...counties which have only recently 'reversed' their decline and generally begun to grow in the 1960's; generally not adjacent to metropolitan areas and characterized by growth in manufacturing industries. (p.I-9)

Poinsett County consists of 760 square miles of rich agricultural land in the northeast delta country of Arkansas. Its traditional agricultural base of rice, cotton, wheat, soybeans, and corn is beginning to diversify with the addition of manufacturing jobs in and around four growth centers.

At the last Census, the County's labor force was employed 19% in agriculture, 33% in manufacturing, and 48% in the service sector. The total population of 28,000 is 91% white and 9% black; median age, 28; median education, 8 years of schooling; median family income $5500. The County contains 8900 housing units of which half are owned and half are rented. The closest large city is Jonesboro to the north, from which growth appears to be spreading south to the smaller towns in the County. Jonesboro has an existing cable system, owned by an MSO, which enjoys a penetration rate of 57% in that market; Jonesboro is also the site of the closest hospital

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* The Hopkins Cable Model is a large scale disaggregated computer simulation model originally developed for the evaluation of urban franchises. It consists of a cost model, which estimates detailed capital and operating costs for the system over a ten-year franchise life; and a demand model, which estimates expected penetration, subscriber and other revenues over the same period. A non-technical description of the full model is available in "Economic Feasibility of a Cable System for Cleveland" [Baltimore: Hopkins Cable Project, Center for Metropolitan Planning and Research, Johns Hopkins University, January 1976]. The Model has also been applied in evaluations of franchises for Baltimore and Detroit.

and university facilities for residents of Poinsett County.

System Design

The system designed as the basis for our economic analysis is a single-trunk, single-feeder, sub-split system without converters but with activated two-way capacity in the trunk lines. This provides 27 forward channels and up to 3-1/2 return channels from any point on the trunk system. Two-way capacity could be activated in the feeder if desired by the addition of a reverse module. The system was designed on the basis of the County's existing utility distribution system and includes 12.85 miles of trunk, 43.95 miles of feeder, and 71.73 miles of supertrunk connecting the eight towns in the County. Interconnection of the system by supertrunk was chosen over the more conventional microwave design because on careful calculation it proved to be both cheaper in initial capital expense and more cost-effective in providing greater channel capacity to the system.*

The basic case analyzed in this report assumes: (1) a demonstration system for Poinsett County would be owned and operated as a rural cooperative, (2) the system would be constructed in a phased manner with the more populous areas of the County wired first so that revenues from subscribers in these areas are available to finance later construction phases, (3) expected penetration of 50%, a rate similar to that of the existing Jonesboro system, and (4) a demonstration system in Poinsett could obtain a waiver of current FCC regulations to carry the network stations from Little Rock.**

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* Urban cable experience involving the use of long amplifier cascades has indicated that such technology is feasible. Precise cost comparisons of supertrunk versus microwave requirements for the system are set out in Appendix #6 of the Report.

** The significance of each of these assumptions is elaborated in the body of the report.

Analysis

Our analytical approach has been to estimate, on the basis of the model calculations, the total capital and operating costs of the potential demonstration system over a ten-year period; to determine the amount of these costs that can be expected to be covered by subscriber revenues for entertainment uses over the period; and to indicate the remaining average annual revenues that would be required to be covered from public service uses, grants, and other sources of non-entertainment revenue for the system to break even.

We then describe three major public service areas which appear most promising for the application of telecommunications in Poinsett (education, health, and consolidated social services), presenting rough cost-benefit estimates for each. Time and resources did not permit an equivalent examination of prospective commercial applications of a potential system in Poinsett; to the extent that commercial applications could be found for leased channel use, the residual cost of the system could be shared between these and the public service sector.

Findings

Results of the analysis indicate that a demonstration system in Poinsett County would cost in the neighborhood of $3,880,000: $1,193,000 in capital plant and equipment, $1,546,000 in operating costs over ten years, and $1,141,000 in interest, at 8.5%. Subscriber fees for entertainment uses are anticipated to yield $1,903,000 in total revenues over the period, covering 49% of total system costs and leaving $1,976,000, or 51%, to be covered from non-entertainment applications of the system.* This

* Interest charges at alternative rates ranging from 5 to 10% are presented in the text. At 5%, subscriber revenues would cover 68% of total costs; at 10%, subscriber revenues would cover 46% of total cost.

amounts to a requirement that average annual revenues of $86,629 be contributed from public service and commercial sectors for the system to break even over a 15-year period. Alternatively, if outside sources could be found to contribute the capital cost (plus interest) of the system, anticipated subscriber revenues would cover all operating costs and generate a small ($357,000) surplus, which could be used to subsidize the public service uses of the system.

In evaluating the potential public service applications of the system for Poinsett, we have stressed that most involve the provision of more or higher quality levels of service at increased budgetary cost to state and local agencies. These incremental costs are set forth in the text of the report and must be taken into consideration in assessing whether the net benefits of such uses can approximate the required annual contributions cited as necessary for the system to break even.

Finally, we have calculated the breakeven subscriber fees and penetration rates for the basic system. At a $6/month basic subscriber fee, with 28% of subscribers electing to receive pay services at an additional charge of $6.50/month, a penetration rate of 74.5% would be necessary to finance the system entirely from entertainment uses (excluding interest charges).* At higher basic monthly fees, the required breakeven penetration is reduced; to break even (excluding interest charges) at the assumed 50% penetration rate using subscriber revenues as the sole source of income would require a monthly fee of approximately $9 for basic service.

While it is evident that the small number of dwelling units in Poinsett County severely reduces the probability of being able to finance a cable

* These calculations account for effective installation charges, pay revenues, and monthly fees for basic service.

system through subscriber revenues alone, it is important to note that (1) subscriber revenues can cover total operating costs of the system once constructed; (2) the required initial capital cost of slightly over $1,000,000 (exclusive of interest) is a rather modest investment as cable systems go; and (3) the average annual net contribution from non-entertainment sources, ranging from $41,000 to $100,000, required for the system to break even may be within the bounds of feasibility. This is, however, a judgment that can only be made by those responsible for local service delivery and the funding of local agencies.

An alternative to looking to outside sources for contribution of the capital investment for a demonstration system in Poinsett might be to explore the feasibility of reaching the County through a link from the existing Jonesboro system. This would provide economies of scale in management and service operations, and might be expected to cut some $40,000 per year from the total cost of serving Poinsett residents.

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Finally, we thank Dr. Gretchen Kolsrud, William Mills, and Lucia Turnbull of the Office of Technology Assessment for their cooperation and assistance in expediting a number of tasks which made it possible for this work to be completed on a very short schedule.

PREFACE

In April, 1976, the staff of the Office of Technology Assessment, responding to a request from Senator Herman Talmadge, issued a preliminary evaluation of "The Feasibility and Value of Broadband Communications in Rural Areas" (U.S. Congress, Office of Technology Assessment, Washington, D.C.). This report was a survey of the potential uses for telecommunications in rural, less densely settled areas, examining the ways in which telecommunications might reinforce rural development efforts while taking full note of the disappointing use to date of telecommunications to deliver social services in urban settings.

The failure of cable television systems to be used more extensively for the delivery of social services and to support commercial endeavors is traceable primarily not to immaturities in the technology itself, which has been adequately demonstrated in a number of pilot projects, but to problems with economic inefficiencies, and social and psychological adaptations which are required to make use of the new technology. In particular, the cable industry itself, structured as a regulated private investment venture after the broadcasting industry, has proven a poor instrument, in its infant evolutionary stages, for financing the software and the marketing required to explore adequately the value of non-entertainment applications of the medium. As the OTA report aptly stated:

> ...detailed consideration of a system approach to broadband communications in which costs are shared and revenues are generated by public users, commercial users and subscriber-supported entertainment fees has not been attempted. However, such a system approach may be the key to an economically viable broadband system which could serve an entire rural community. (p. I-7)

The prospect that cable may provide a more promising means of delivering certain services in rural than in urban settings is based on: (1) the greater

I. INTRODUCTION

Background Description of the Study Area: Poinsett County*

Poinsett County is 760 square miles of rich agricultural land situated in the northeast delta country of Arkansas. Its traditional agricultural base of rice, cotton, wheat, soybeans, corn, and cattle is beginning to diversify with the addition of manufacturing jobs in and around the four growth centers of Harrisburg, Marked Tree, Trumann, and LePanto. At the last Census, the County's labor force was employed 19% in agriculture, 33% in manufacturing, and 48% in the service sector, including domestic help and the self-employed.

The total County population of 28,000 is 91% white and 9% black; median age, 28; median education, 8 years of schooling (only 24% of the population are high school graduates); median family income, $5500 (about one-third of the population have incomes below the poverty level). The County contains 8900 housing units, of which half are owned and half are rented. The closest large city is Jonesboro to the north, from which growth appears to be spreading south to the smaller towns in the County. Jonesboro has an existing cable system, Jonesboro Cable TV, owned by an MSO, UA Columbia, which enjoys a penetration rate of 57% in that market; Jonesboro is also the site of the closest hospital and university facilities for residents of Poinsett County.

Poinsett County was selected by the research team at OTA as typical of the types of rural counties they have characterized as "turnaround reversal" situations; that is, "counties which have only recently 'reversed' their decline and generally begun to grow in the 1960's; generally not adjacent to metropolitan areas and characterized by growth in manufacturing industries."** The working hypothesis

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* For a more detailed description of the County, see East Arkansas Planning and Development District, Poinsett County Profile (mimeo, March 1976). An excellent half-inch videotape presentation, "Poinsett County Profile," is also available from Richard Spelic, Director of the East Arkansas Planning and Development District.

**OTA, The Feasibility and Value of Broadband Communications in Rural Areas (April, 1976), p. I-9.

distances (and concomitant time and travel costs) that must be overcome to reach rural service centers and acquire services in rural settings, and (2) the stabilization of out-migration flows from rural regions and concomitant resurgence of interest in rural development. If, as some planners have maintained, some indefinable "quality of life" attracted large numbers of the population to urban centers over the past two decades, a similar desire may now be drawing population back to suburban and rural areas.

In examining the relationship between local service levels and rural growth patterns, OTA identified two types of counties: "turnaround acceleration" counties, adjacent to metropolitan centers, which have shown continuous growth in service industries since 1950; and "turnaround reversal" counties, located outside metropolitan areas, which have reversed declines in population through manufacturing growth since the 1960's.

In order to explore in more detail the economic feasibility of a rural broadband telecommunications system supported by revenues from subscribers, commercial, and public service users, OTA selected a prototype rural county for which a potential demonstration cable system has been designed and evaluated. The analysis of projected capital and operating costs, anticipated revenues, prospective public service applications, and rates of return was made using the Hopkins Cable Model, a large-scale disaggregated computer simulation model.* This model, originally developed for analysis of urban cable systems, was substantially modified during this study so that the particular characteristics of rural areas could be realistically evaluated.

* The Hopkins Cable Model consists of a cost model, which estimates detailed capital and operating costs for the system over a ten year franchise life, and a demand model, which estimates expected penetration, subscriber and other revenues over the same period. A non-technical description of the full Model is available in "Economic Feasibility of a Cable System for Cleveland" (Baltimore: Hopkins Cable Project, Center for Metropolitan Planning and Research, Johns Hopkins University, January 1976).

is that the quality of life in such areas can be enhanced by the use of telecommunications for the delivery of various personal and social services normally available only to populations in more densely settled urban areas.

Organization of the Analysis

In Poinsett County we have designed a demonstration system capable of accommodating a number of social service uses which might share the cost of the system network. A straight entertainment network would have been simpler in design and cheaper to construct but its costs would have exceeded the revenues over any reasonable time frame. Our proposed system is obviously more expensive because of the additional channel capacity and two-way capability necessary to accommodate non-entertainment users; however, in light of the available options, it appears to be the most feasible system in terms not only of maximum present channel capacity, but also of future expansion.

While variations on this design can be developed which cost slightly more or less, and consequently provide more or less service, the basic design presented here is most suitable given the essential economic characteristics of the Poinsett market.

We have approached analysis of the feasibility of a demonstration cable system for Poinsett County by (1) designing a phased construction system for the County, (2) estimating total capital and operating costs of each segment, (3) projecting the revenues that might be anticipated from basic subscription to cable service for entertainment, and (4) calculating the remaining volume of revenue it would be necessary to raise from commercial and public service applications to permit the system to break even financially. Alternate fee schedules are explored which divide the necessary breakeven revenue charges among users in a variety of different ways.

As a basic case, we have assumed that a prototype system in Poinsett would be owned as a rural cooperative analogous to those currently delivering electric power in Poinsett and many other rural areas. The major economic distinction between private and public (co-op) ownership lies in the (perhaps) superior borrowing ability of a public authority and its exemption from state and federal income taxation. As suggested in this report, a demonstration project in Poinsett County might well utilize some combination of private, state, and federal investment in the form of loans, equity, and grants.

The basic case analyzed below rests on the following assumptions:

1. The demonstration system would be owned and operated as a rural cooperative.

2. The system would be limited to a simple single-trunk, single-feeder design with no convertors, which provides ample channel capacity while keeping initial capital investment to a minimum.

3. A phased construction plan is used in which the denser, more populous areas of the County are wired first so that revenues from subscribers in these areas are available for Phase II .

4. We assume a 50% penetration rate for a demonstration system, a rate similar to that of the existing Jonesboro system.

5. Finally, we assume that a demonstration system could obtain a waiver of current FCC regulations in order to carry the duplicate stations from Little Rock in addition to those from Memphis currently required. (see page 15 for elaboration)

We regard this report as a first cut at evaluating the technical and economic feasibility of a potential demonstration rural cable system for Poinsett County. While we have made the analysis as detailed as time and resources permitted, we would urge that additional investigations be made, especially of the potential social service applications suggested here with more precise designs for their adoption involving the local users, in the event that a demonstration system is planned.

II. SYSTEM CHARACTERISTICS

The following analysis of the Poinsett market was made for a basic system design composed of a single-trunk, single-feeder, sub-split system without convertors but with activated two-way capacity in the trunk lines. This allows for 27 forward channels and up to 3 1/2 return channels (3 full video plus some data) from any point on the trunk system. The two-way capacity could be activated in the feeder if desired by the addition of a reverse module; however, the opportunities for two-way uses from individual homes are not sufficiently cost-effective to warrant the considerable additional expense of activated two-way feeder as part of the initial investment in a demonstration system.*

The proposed system was designed on the basis of the County's existing utility distribution system; the resulting layout is for a workable, not necessarily optimal, cable system.** The system as designed includes 12.85 miles of trunk and 43.95 miles of feeder in all eight towns, connected by an additional 71.73 miles of supertrunk, as shown below.*** The system headend is located in Trumann and is linked by microwave to the Jonesboro CATV tower, twenty miles to the north of the city. In addition to minimizing tower cost this allows for the possibility that a demonstration system in Poinsett might be developed as an extension of the Jonesboro operating system. A cable line also links the tower to Craighead Memorial Hospital, which serves as the anchor of a county-wide teleclinic network requiring

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* For design specifications of trunk, feeder, and headend equipment, see Technical Appendices 1 and 3.

** Existing distribution systems in the County are owned by three different electric utility companies (Arkansas Power and Light, Craighead County Electrical Co-op, and Mississippi County Electrical Co-op). The existing overhead distribution facilities were mapped by us on a site visit, during which the actual cable route was driven and the condition of the existing poles recorded. There are no underground distribution facilities in any part of the County.

***While long distance cable links have not been typically used by the industry, we have chosen them in this case because they are more cost-effective, providing greater channel capacity at less cost, than microwave links. We believe urban industry experience involving the use of long amplifier cascades has indicated that such technology is feasible. (For cost comparisons, see Technical Appendix #6.) Supertrunk consists of 1.00", low-loss coaxial cable.

two-way communication capability with sites in Trumann, LePanto, and Harrisburg (see further discussion in Section IV). In addition to the health channels, the microwave link to the Jonesboro system also carries the pay and imported independent signals for the Poinsett system. A second tower in Trumann handles the reception of broadcast signals to be carried on the cable. For both practical and analytical reasons the whole of Poinsett County is treated as a single market/franchise area.

The system as designed is capable of handling up to 27 forward channels, including 9 over-the-air signals plus 2 imported independents, a pay channel, 2 teleclinic channels, an educational channel for use by the public school system, a social services channel, and an automated weather channel, leaving 10 channels available for leasing, data transmission, additional pay services, and the like. Three reverse channels are available from both the east and west sections of the system for use in conjunction with the telemedical clinics and the public school channel as shown schematically below.*

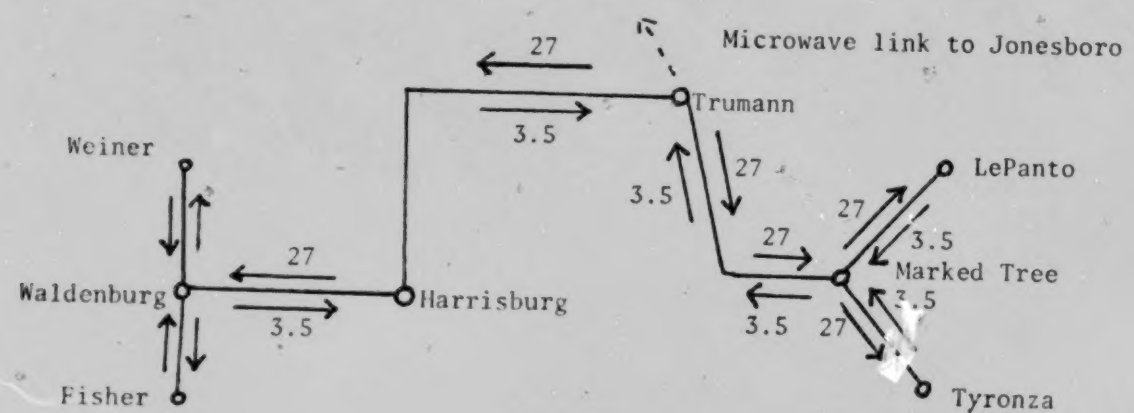

Figure 1

Construction Phasing

The full county-wide system was designed for phased construction to take

* The east section serves Trumann, Marked Tree, LePanto, and Tyronza; the west section serves Harrisburg, WAldenburg, Weiner, and Fisher. Both sections have return capacity to the headend at Trumann. From this basic network, additional trunk could be extended to serve rural portions of the County outside existing towns.

maximum advantage of the revenues generated from serving the major users and the larger, more populous centers first, to finance later expansion of the system to the sparser parts of the County. The routing of the supertrunk lines by construction phase is shown in Figure. 2.* Phase I includes construction of the microwave link from Jonesboro to Trumann, construction of the headend facilities and tower in Trumann, and the linking of Trumann to Marked Tree, Tyronza, and LePanto. Altogether, this entails construction of approximately 30 miles of supertrunk, 7 miles of ordinary trunk line, and 29 miles of associated feeder passing 3780 dwelling units over a period of two years. Phase II includes extention of supertrunk from the Trumann headend to Harrisburg, Waldenburg, Weiner, and Fisher, an addition of about 40 miles of supertrunk, 2 miles of ordinary trunk, and 16 miles of feeder to serve an additional 1240 dwelling units. It should be noted that all but a very few dwelling units are located in or immediately adjacent to the eight towns shown on the schematic map in Figure 1, so that very little additional revenue is generated by potential subscribers located along the supertrunk routes connecting towns. It is envisioned that operating cash flow might eventually permit extension of the system to the more remote areas of the County. However, this does not occur in the time frame of this analysis.

Construction is scheduled so that the link from Trumann to Marked Tree, inclusive of distribution system in those towns, is built in the first year; the link from Marked Tree to LePanto is constructed in the second year; the link from Marked Tree to Tyronza in the third year; the section from Trumann to Harrisburg in the fourth year; the segment from Harrisburg to Waldenburg in the fifth year; and the links from Waldenburg to Fisher and Weiner in the sixth and seventh years. As a consequence, the bulk of the capital costs of

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* Precise routings of trunk and feeder lines in each of the eight towns are shown on the individual maps, Appendix 5.

the network are incurred in the first half of the franchise period. Related feeder lines are built and connected to the trunk as it is constructed in each bloc. Since dwelling units (and hence feeder) are denser in some blocs than in others, the percentage construction pattern for feeder miles varies somewhat from the pattern of trunk construction, although all feeder is strung and connected by the end of the seventh year.

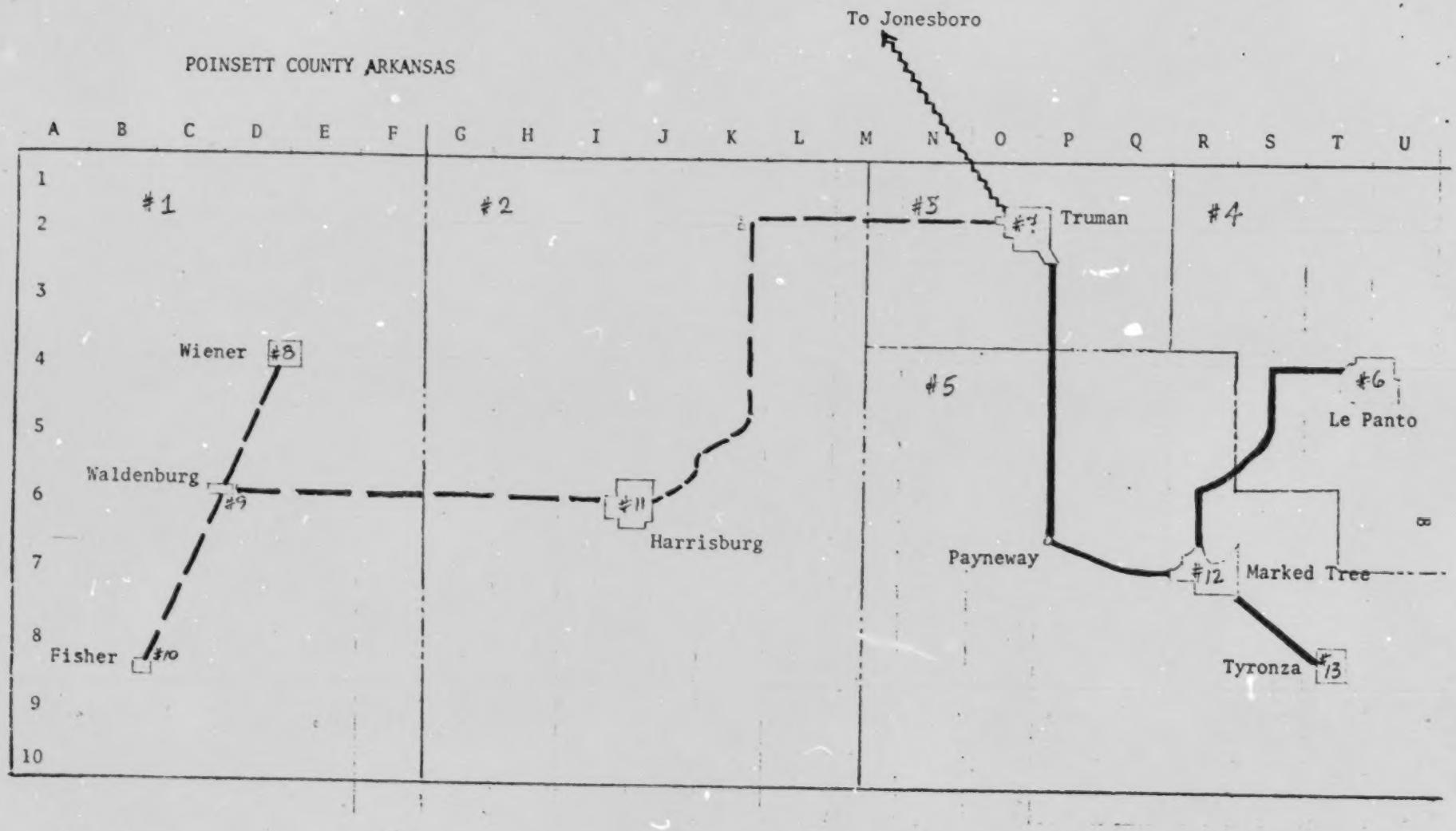

Figure 2

Schematic Map, keyed to bloc designations used in Hopkins Cable Model computations. Numbered areas = reception districts.

Phase I supertrunk links

Phase II supertrunk links

Microwave link

Cable is Jerrold JD 1000, 5.9db attenuation at 216 Mhz
Scientific Atlanta trunk amps placed at slightly less than 22 db (every 3525 feet)
Normal trunk operating level = 32 db

Scale 1 / 250,000

0 1 2 3 4 Miles

N

Assumptions Underlying the Poinsett Calculations

The major assumptions and parameters of the cost model as it was applied to the Poinsett data are shown in the following table. In general, items pertaining to the design and location of the system have come from a detailed map of the existing aerial distribution system, constructed from a field survey done by us in Poinsett and from maps supplied by the local utilities companies. Equipment costs have been taken from 1975-76 price catalogues of Scientific Atlanta, Jerrold, C-Cor Corporation, AML, and Dynair Electronics. Operating costs are based on the reported experience of a sample of 20 systems whose managers were interviewed during the development of the model.* Installation and other labor costs have been adjusted to reflect regional wage scales.

Demand characteristics used in making penetration estimates have come from standard statistical sources (Television Factbook, U.S. Census of Population), published documents, and a series of signal strength readings made on site by the research team. Information on signal carriage regulations has been developed from the Code of Federal Regulations, Title 47, Telecommunications, October 1973. Finally, some items, such as projected inflation rates, have simply been set by assumption. In these cases, we have been conservative in the assumptions made, based on the logic that the resulting cost estimates would provide a minimum cost base from which the reader could work if he preferred to add higher inflation rates or other costs to the total.

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* The original cost model was calibrated using detailed cost breakdowns provided by a sample of 20 operating systems across the country. Cost information was provided by the general managers of the systems and in some instances by the central management of the MSO's on a confidential basis. The cost factors used in this analysis were selected from systems most nearly approximating the sort of system designed for Poinsett County.

Table 1

Model Parameters and Assumptions Underlying the Poinsett County Analysis: Basic Case

The following is a list of selected parameters used in the Hopkins Model for the cost and revenue estimates made for the Poinsett market. They may be compared with the specifications of other models described in A Comparison of Economic Cable Models' Data Inputs (U.S. Department of Commerce, Office of Telecommunications, December 13, 1974), which summarizes assumptions for Baer, Commanor-Mitchell, Mitchell-Smiley, Crandall-Fray, Park, and OTP/MITRE models.

Plant and Equipment		Source
1. Number of trunk miles	12.80	Design submodel based on aerial distribution survey maps.
2. Number of feeder miles	43.95	
3. Number of supertrunk miles	71.73	
4. Percent of trunk underground	0%	
5. Installation costs		Constructed from individual equipment and labor costs for strand stringing, splicing, and lashing.
a) Aerial trunk (per 1000') on existing poles:		
Ordinary trunk	$ 697	
Supertrunk	904	
b) Aerial feeder (per 1000')	$ 433	All feeder assumed to run on existing poles.
c) Materials cost of connection to dwelling unit:	16.65/du	Calculated from cost of drop cable, connectors, transformers, pay trap filter, and line extender where required.
6. Application Fees	None	No application fees required by Arkansas Power and Light or Craighead County Electrical Cooperative.
7. Rental Rates:		Based on standard license agreements of APL and Craighead Coop, and assuming an average pole spacing of 275' in the towns and 350' throughout the rest of the County.
Ordinary trunk	$11.42/1000'/year	
Supertrunk	14.54/1000'/year	

8. Technical parameters:

a)	oper. db gain on trunk amps	22
b)	oper. db gain on line extender amps	24
c)	insertion loss on bridger amps	1.6
d)	trunk system oper. level	32
e)	feeder oper. level	40
f)	db loss on trunk split	3.5
g)	attenuation/1000' of 1" supertrunk	5.9
h)	attenuation/1000' of .75" trunk	7.45
i)	attenuation/1000' feeder	11

Demand Characteristics

9.	Estimated penetration	50%, 25% (Countywide)	By assuming penetration roughly equivalent to the Jonesboro operating system (50%) and, alternatively, calculated from Hopkins demand model (25%) by district.
10.	Penetration growth pattern	.8, .14, .02, .02, .02	By assumption, derived from experience of sample systems.
11.	Percentage of color sets	58%	Arbitron Television Census, Fall 1974.
12.	Percentage of UHF antennas	81%	Arbitron Television Census, Fall 1974.
13.	Number of dwelling units	8,923	U.S. Census of Population, 1970 (U.S. Dept. of Commerce)
14.	Average household income	$6,650	U.S. Census of Population, 1970
15.	Channel carriage on cable (Cases A, B)		By calculation from FCC regulations and over-the-air reception taken from on-site signal readings.
	a) # networks	3, 3	
	b) # independents	0, 2	
	c) # educationals	2, 2	
	d) # duplicates	4, 1	
16.	Installation charge	$ 15	By assumption.
	- paid by % of subscribers	50%	

17.	Subscriber fee 1st set 2nd set	$ 72/year 6/month 3/month	By assumption
18.	% of second connections	11%	From statistical models based on a sample of operating systems. See Hopkins Cable Project "Technical Paper #7."
19.	% of 1st set disconnections	24%	
20.	% of 2nd set disconnections	16%	
21.	% of 1st set reconnections	47%	
22.	% of 2nd set reconnections	47%	
23.	Maximum percentage of subscribers taking pay-TV	28%	By assumption. Approximately the same as recent estimate by Stanford Research Institute.
24.	Net monthly revenues per pay subscriber	$ 1.80	Based on standard HBO contract which splits $6/month fee with operator. Allows for operator's expenses in serving each subscriber.
25.	Headend cost a) headend b) microwave link	 $73,190 $118,534	Designed from 1975-76 equipment catalogues of Scientific Atlanta, Jerrold, and AML. See Technical Appendix.
26.	Program origination equipment	$4,000	

Operating Costs

27.	Franchise fee:	None	System owned by non-profit cooperative.
28.	Insurance:	$5/1000 on book value of all tangible assets (property damage only, no liability coverage)	From sample of operating systems.
29.	Taxes:		
	a) Income, Federal	None	System owned by non-profit cooperative.
	b) Property	$1.23/$100 of assessed value (at 20% of assessment rate)= average County rate over all tax districts	Calculated from tables supplied by Poinsett County Assessor's Office, Harrisburg, Ark.
	c) FICA, employer's	5.85% to 6.25%	Federal Tax Course, p. 175, section 2601.
	d) FUTA, employer's	3.2%	Federal Tax Course, section 2608.

30.	Local labor rates:		Average industry pay scales adjusted for regional labor rates.
	a) Installers	$3.75/hour (straight-time)	
	b) Service techs.	$4.25/hour (straight-time)	
	c) Micro & bench tech.	$11,000/year	
	d) General Manager	$13,000/year	
	e) Secretary	$ 6,000/year	
31.	Staff benefits:	12% of straight-time, direct labor cost	Average over all categories.

Financial Parameters

32.	Interest rates evaluated	5%, 8.5%, 10%	By assumption.
33.	Bad debt percentage	1.5% of subscriber revenue	Derived on basis of MSO experience.
34.	Debt: equity	unspecified	System owned by non-profit cooperative.
35.	Inflation rates:		By assumption.
	a) installation and materials cost	5-10%	
	b) distribution rental rates	2-10%	
	c) 1st connection subscription fee	2%/year	
	d) 1st and 2nd installation charges	5% every 3rd year	
	e) equipment costs	3%/year	
	f) 2nd connection subscription fee	2%/year	
	g) labor (merit increase)	5%/year	
36.	Depreciation lives:		In accordance with Federal Tax Code specified asset lives.
	a) buildings	10 years	
	b) headends	10 years	
	c) trunk and distribution system	10 years	
	d) test equipment; leasehold improvements, furniture & fixtures	10 years	

III. SYSTEM COSTS AND REVENUES: POINSETT COUNTY

The results of the model calculations for Poinsett are presented in a set of financial statements--balance sheet, income statement, cash flow statement, and payroll table--displayed in the Appendix. The model projects a County-wide system costing in the neighborhood of $3,880,000.* Of this total, approximately $1,193,000 would be required for capital investment in plant and equipment and $1,546,000 for operating costs to connect, disconnect, bill, and service subscribers over the franchise period. The remaining $1,141,000 represents the opportunity cost of borrowed funds over the period calculated at 8.5%. The opportunity cost of invested funds is an implicit cost of the system regardless of the particular mix of funding sources (private equity investment, loans, or grants). It should be recognized that the subsidy value of grants to the system includes the foregone interest on those funds as well.

Anticipated reveunes to the system have been estimated on the assumption of a 50% penetration rate among households and, alternatively, using the lower penetration of 24.9% yielded by the Hopkins demand model (see Table 2 p.16).* The 50% penetration estimate yields total system revenues (including pay-TV) of $1,903,000 over the ten-year period for a $6/month subscriber fee. These would cover 49% of all costs including interest and 69% of total capital

* This figure is the sum of:

Capital and distribution system & equipment	$1,192,770
Operating costs	1,546,170
Interest on long term debt @ 8.5%	1,140,615
	$3,879,555

Capital costs include: headend, program origination equipment, furniture and fixtures, trunk & distribution system, test equipment, leasehold improvements, inventory, land, and organization expense.

**The 50% penetration assumption is based on the experience of the Jonesboro system which carries the valuable Little Rock stations (see second footnote, p.17) and assumes a waiver of current FCC regulations could be obtained for a Poinsett system. In order to bracket the range of probable penetration rates, we made an alternate projection based on our demand model for urban markets where competing forms of entertainment lower penetration rates generally. The resulting 24.9% rate may be thought of as a lower bound for a rural system in Poinsett.

plus operating costs exclusive of interest. While it is apparent that subscribers cannot carry the whole system, their fees are sufficient to cover the marginal (operating) costs of providing the medium for entertainment once the system has been constructed. This is a classic instance of the fixed versus variable cost problem: if dependent wholly on subscriber revenues, an operator will not choose to build the system; yet if it exists, he will find subscribers covering the marginal cost of serving them and, in this case, even contributing a small amount towards the capital costs of the system. The obvious solution is to look for additional revenues and other users, the possibilities for which are discussed in a following section.

As an alternative to the assumption of a 50% penetration rate, we also estimated penetration for each of 13 reception areas and for the County as a whole, using the Hopkins demand model.* Penetration rates were projected for two cases (displayed in Table 2) bracketing the range of possible assumptions concerning signals to be carried on the cable as follows:

Option A: Cable system carries required local signals plus three duplicate networks from Little Rock, but no other imported signals.**

Option B: Cable system carries required local signals plus one class-A and one class-B imported independent, but no duplicate networks.

In August 1976 a field survey was made in which the reception quality of both video and audio signals was measured and special reception problems associated with terrain and interference were noted. Local signals received

* Hopkins Cable Project, Estimation of an Urban Cable Demand Model and Its Implications for Regulations for Major Markets (Baltimore: Center for Metropolitan Planning and Research, Johns Hopkins University, March 1976).

** Under current FCC regulations, three network stations in Memphis, Tenn. are significantly viewed and must be carried despite the fact that they carry political and other programming irrelevant to Arkansas viewers, while a cable operator in Poinsett could not carry the duplicate networks from Little Rock without an FCC waiver.

Table 2

Estimated Penetration Rates: Poinsett County
(using Hopkins cable demand model and
assuming a $6/month subscriber fee)

District	Signal Carriage Options*	
	A	B
1	.316	.249
2	.248	.206
3	.231	.194
4	.138	.113
5	.191	.158
6(LePanto)	.205	.171
7(Trumann)	.270	.228
8(Weiner)	.318	.271
9(Waldenburg)	.258	.217
10(Fisher)	.353	.303
11(Harrisburg)	.354	.304
12(Marked Tree)	.221	.185
13(Tyronza)	.268	.226
Countywide	.249	.208

* Signal carriage options are composed of:
A: 3 networks,2 educationals, 4 duplicate networks, no A-or B-independents or foreign-language stations.
B: 3 networks, 1 A-independent, 2 educationals, 1 duplicate network, 1 B-independent, no foreign-language stations.

** Districts are shown on schematic map of County.

in all parts of the County include:

WREC (Ch 3) CBS from Memphis
WHBQ (Ch 5) NBC from Memphis
KAIT (Ch 8) ABC from Little Rock
WKNO (Ch10) E from Memphis
WHBQ (Ch13) ABC from Memphis

In addition, the western portion of the County, including the towns of Weiner, Waldenburg, Fisher, and Harrisburg, also receives:

KETS (Ch 2) E from Little Rock
KARK (Ch 4) NBC from Little Rock
KATV (Ch 7) ABC from Little Rock
KTHV (Ch11) CBS from Little Rock

Our signal readings indicate that reception of these Little Rock stations is considerably weaker than the Memphis stations. Because Little Rock stations carry political and other news more relevant to Arkansas citizens we would expect the value of improved reception of these signals on cable to be substantial.

It is evident from Table 2 that subscriber fees of $6 per month may be expected to produce 1250 to 1050 subscribers countywide, implying annual subscriber revenues of $90,000 to $75,600, depending on signal carriage option assumed. The difference between these rates reflects primarily the incremental value to viewers in Poinsett of the duplicate stations from Little Rock.*

Breakeven Subscriber Fee

As a first cut at the problem, we can calculate the monthly subscriber fee that would be necessary to cover total capital and operating costs over the life of a ten-year demonstration system on the assumption that subscriber revenues would be the sole source of income to the system. We have estimated breakeven fees for the assumption that 50% of households would subscribe and

* Because the model was based on a sample of markets whose duplicate stations are largely located in the same state, it probably underestimates somewhat the value of the Little Rock stations to Poinsett viewers.

for the lower penetration rates produced by the demand model.

Breakeven Monthly Fee: Capital and Operating Costs

Number of Subscribers	Breakeven Monthly Fee* with pay-TV	without pay-TV
2500(50%)	$7.13	$9.13
1250(25%)	14.27	18.26
1050(21%)	16.98	21.74

*Based on assumption of $6.50 per month pay-TV charge paid by 28% of basic subscribers. Recent increases in pay-TV offerings across the country have not yet been carefully analyzed but a casual survey of operators suggests that no substantial impact on basic penetration rates is being experienced, while 25-30% of existing subscribers on average elect pay options at rates ranging from $6 to $10 per month.

Alternatively, if we consider the possibility that the capital costs of the system might be borne by outside sources (including federal and state agencies, private foundations, and the like) so that subscribers need only support the operating costs of the system, the necessary monthly breakeven fee would be reduced by about half.

Breakeven Monthly Fee: Operating Costs Only

Number of Subscribers	Breakeven Monthly Fee: with pay-TV	without pay-TV
2500(50%)	$4.03	$5.15
1250(25%)	8.05	10.31
1050(21%)	9.59	12.27

Since interest charges on the capital investment are excluded in both the breakeven fee tabulations above, these should be read as the monthly fees that would be necessary to break even (1) if outside sources were willing to lend the capital investment amount interest-free, and (2) if outside sources

were willing to provide both the capital sum and to forego its interest value as well.

Alternatively, it is possible to calculate the breakeven penetration rates required at various subscriber fees as follows:

Monthly Subscriber Fee	Required Breakeven Penetration*
$5/month	88.0%
6/month	74.5
7/month	64.5

* Accounts for effects of pay revenues and effective installation fees.

The above tabulations make it rather clear that, except at penetration rates of 50% or better, some subsidization of initial capital costs would be necessary to keep the breakeven subscriber fee in the $5-$7 range of most rural systems in operation in the country. The nearest operating cable system in Jonesboro enjoys a penetration rate of about 50% and this may not be an unreasonable expectation for Poinsett County. However, the alternate demand model projections suggest that the relatively lower income levels in Poinsett County and the restriction of the Little Rock stations might well reduce its penetration below 50%.

It is evident, then, that the small number of households in Poinsett County cannot support the cost of a demonstration system through subscriber fees alone and that some form of split charges, cost-sharing, and/or subsidization would be necessary to make the system feasible.

Entertainment Uses and Required Public Service Contributions

The contribution of basic entertainment uses to the support of the system is best appreciated from an analysis of operating cash flow as detailed in Table 3 . This shows that after year six, entertainment revenues are sufficient to cover the cumulative cash operating expenses and that by year ten they generate a modest surplus of $102,000 as a contribution to capital costs. If the operating cash flow is projected to year 15, entertainment services generate an additional $20,000 per year above expenses for a 15 year contribution to capital costs of $203,000 . With total capital costs of the system at $1.168 million (excluding intrest) this leaves $966,750 to be recouped from other services. In other words the social services offered on the system must have an average annual value of $65,000 for the venture to be economical on a system paying no interest on its invested capital; this does not imply, however, that the auxiliary services must contribute that amount. If federal, state, and private sources could be found to contribute $1 million of initial capital investment, basic entertainment revenues would cover all direct operating costs and provide a small surplus for support of selected non-commercial uses of the system.

Alternatively if the time value of capital is to be considered, the modest operating surpluses generated by subscribers must clearly be augmented by fees charged to the public service users sufficient to cover capital costs plus interest over the life of the system. The level of fees required of the public service users under any assumed interest rate is equivalent to the required annual mortgage payments on an amount equal to the present value of the system cash flow at that interest rate. Some representative values for the fees are given in Table 4 .

Table 3

Contribution of Entertainment Uses to Operating Cash Flow

	1	2	3	4	5	6	7	8	9	10
Oper. Cash Sources	51.05	120.48	147.19	171.80	200.82	218.35	227.40	233.16	238.25	242.93
Oper. Cash Uses	707.16	236.70	170.74	357.90	309.71	223.48	173.83	179.79	183.91	188.53
Oper. Cash Generated	(656.11)	(116.22)	(23.55)	(186.1)	(108.89)	(5.13)	53.57	53.37	54.34	54.40
Cum. Oper. Cash	(656.11)	(772.33)	(795.88)	(981.98)	(294.99)	(300.13)	(246.55)	(193.18)	(138.84)	(84.44)

Note: Average annual net cash generated by entertainment uses stabilizes at $53,000 per year after year 6 if allowance is made for $8000 per year in additional capital costs and fluctuations of the firm's cash position as reflected on the balance sheet.

Table 4

Annual Public Service Subsidies Required to Break Even at Various Interest Rates (figures in thousands)

	1	2	3	4	5	6	7	8	9	10	11	12
Annual Cash Flow*	(656.1)	(116.2)	(23.6)	(186.1)	(108.89)	(5.13)	53.4	53.4	53.4	53.4	53.4	53.4

13	14	15
53.4	53.4	53.4

Rate	Present Value	Annual Payment Required to Support Value at Rate
0%	($619.00)	$41.27
5%	(711.76)	67.55
7%	(726.86)	78.43
9%	(734.15)	89.41
11%	(735.69)	100.35
12%	(734.81)	105.89

* The annual flow is assumed to stabilize at $53,000/year after year six. This ignores the fluctuations of the firm's cash position, but this is merely a transaction which cancels out with the Balance Sheet.

In our examination of potential public service applications of a Poinsett system (Section IV) we have noted that most of the apparent opportunities for cable use are directed to extending the County's existing resources to reach a larger clientele and to offering increased services at increased absolute budgetary costs to the agencies. Very rough (conservative) estimates of potential benefits to these additional clients suggest that the proposed cable applications might well generate gross client benefits of $175,000 or more annually. However, these benefits come at the additional costs indicated in Section III so that net benefits from cabled services are certainly lower. With the information at hand, we are not able to make a more specific judgment as to the possibility of eliciting actual payments for non-commercial uses of the cable equal to the required breakeven amounts.

IV. POTENTIAL PUBLIC SERVICE APPLICATIONS OF CABLE IN POINSETT

The following sections identify three public service areas in which a demonstration cable system could be used to stretch resources, reach additional clients, and/or effect some savings in cost per unit of service delivered in Poinsett County. These areas are education, health, and consolidated social services. In each case, we describe briefly the existing service system, indicate the ways in which cable could be used, and estimate in rough terms the magnitude of the costs and benefits attributable to such applications. In some cases, we have indicated ways in which the marginal costs of such applications could be combined to share facilities and staff.*

In discussing the costs and benefits of the selected public service uses for Poinsett County, we classify applications by type of system required (one-way, one-way video with return audio, full two-way) and by level of service provision as follows:

	Standard one-way system	One-way video with audio return	Full two-way system
Applications resulting in delivery of current level of benefits at lower cost			
Applications resulting in an increased level of service at same cost			
Uses resulting in an increased level of service at increased cost.			

* Experience teaches that an important element of successful service experiments involves harnessing the support and initiative of interested agencies. We strongly recommend that the possible applications discussed in this section be explored in more detail with input from local agency personnel if actual construction of a demonstration system is contemplated.

Additional distinctions are made in the text between benefits which accrue to the public in the form of budgetary savings and other resource economies, and benefits which accrue primarily to private individuals in the form of time savings, increases in earning power, reductions in user fees, and the like. While these distinctions are seldom precise, it is useful to apply them in a general way to stress the distributive effects of such cable applications.*

The OTA report also identified four potential applications of a cable system which could be attractive to commercial users. These were: security services, information services, data transmission, and pay television. A market for some of these applications may exist in Poinsett County, and if so, could contribute to cable system revenues. However, time did not permit exploration of these revenue sources in this study.

* In a parallel evaluation study for the City of Baltimore (Municipal Service Applications of Cable for Baltimore City, Hopkins Cable Project, December 1974), we found that a majority of the feasible applications of cable to municipal services in that urban setting yielded private rather than public benefits, a circumstance which justified a smaller public investment in the system than might have been supposed.

Educational Applications of Cable in Poinsett County

The public school system in Poinsett County is composed of seven autonomous school districts, one in each of the six incorporated towns and a Common District which serves the north central portion of the County area outside the town limits. At present, the only formal coordination among school districts occurs through an administrative secretary who handles consolidated record-keeping, and the assignment and administration of Federal and State Department of Education programs in the several districts.

Basic data on number of teachers, students, and annual payrolls for the Common District and each of the six town school districts is summarized in Table 5. * Virtually all of these units are tiny, only two (Harrisburg and Trumann) having more than 1000 students in all grades through High School. While pupil/teacher ratios are generally low (less than 20), the dispersion of schools and the small scale on which each operates entail the duplication of special staff such as speech therapists, special education teachers, and remedial math and reading teachers across districts. Each of the six independent districts has its own band and/or music instructor, each has at least three special education teachers, its own librarian, four of the six have their own art teachers, and five have at least one counselor.

In addition to grades K-6, basic scholastic instruction is provided in English, mathematics, home economics, science and social studies, business education, agriculture, and physical education. In addition, some schools offer industrial arts, driver education, biology, Spanish, and chemistry.

School superintendents with whom we spoke indicated that they would like more staff to add or expand programs in vocational education, remedial and

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* The Common District serves the North Central areas of the County, outside the towns.

Table 5

Poinsett County School Districts: Staff, Students, and Annual Payrolls

	# of Teachers[a]	# of Students	Spec. Educ. Studs.	Total Annual Payroll	Payroll for Spec. Educ.	# of Spec. Ed. Teachers
Common	17	116 (elem.) 111 (middle & high)	7 0	$ 136,700	$ 16,725	(2)
Harrisburg	40	552 756	20 28	557,300	45,195	(5)
LePanto	41	378 340	26 25	373,700	41,650	(5)
Marked Tree	69	579 782	19 31	684,400	26,295	(3)
Trumann	100[b]	1005 1176	0 31	860,500	88,535	(10)
Tyronza	22	189 159	0 0	228,400	36,616	(4)
Weiner	35	366 261	4 0	353,800	24,961	(3)
TOTAL	324	3185 3585	191	$3,195,000	$279,977	(32)

[a]Excluding principals, administrative personnel, and teachers' aides.

[b]Including Migrant Program, which employs a director, 2 teachers, 4 aides.

special education, and adult education courses, including high school equivalency certificate courses. In the field of special education, particular mention was made of needs for instruction for the mentally retarded, for the services of a psychologist to help with emotionally disturbed children, and for teachers trained to offer enrichment courses in journalism, dramatics, higher mathematics, and advanced science. Because only a quarter of the County's residents have completed high school, the scope for adult education courses is also substantial. In the following sections, we discuss the costs and benefits of cable transmission for: (1) the sharing of specialists among school districts, (2) remedial and special education, and (3) adult and vocational education.

1. Sharing of specialists among school districts would be made possible by the establishment of a two-way link connecting all seven schools. This would enable the seven districts to share the incremental costs of one psychologist specializing in problems of emotionally disturbed children, one instructor for advanced mathematics, and one advanced science teacher. These individuals could be made available approximately one day a week to each school for the incremental cost of one-half teacher position per school, or about $7000 per school budget.

We note that the psychologist is the only use which strictly requires two-way capacity since both mathematics and science courses could be taught via one-way instructional techniques. However, since these would be advanced courses for special students, two-way reactive communication would permit testing and immediate feedback of student comprehension.*

2. Remedial and special education is distinguishable by the fact that it is largely an in-school application, to which cable may contribute by making a specialist instructor more accessible to the several school districts.

* We are obliged to note that the services of specialists could be shared even now by having instructors commute to different schools by automobile since the distances involved are reasonable (perhaps 30 miles). The fact that this is not done appears to be more a function of organizational independence than distance.

Special education teachers are employed by each of the constitutent school districts as shown in Table 5. Altogether, the County employs 32 special education teachers (including speech therapists) and spends $280,000 annually, or about $1466 per special education student, for their services. In 1975-76, there were 191 special education students reported in the County or about 2.8% of the total student body of 6770. In short, about 8.8% of the total County school budget is spent to service 2.8% of the students in the region.

While much remedial work requires individualized attention, common and more interesting core materials might be offered to regular teachers in all schools by cable for dealing with special remedial problems. Much of this instruction could utilize one-way transmission, although two-way response would provide some feedback to the specialist and permit simultaneous testing for comprehension of individual students. This use would require a minimum of one television receiver per school and the time of one remedial teacher to prepare (or borrow already prepared) materials, arrange for their viewing, and monitor the progress of students and teachers in each school using the service. At a maximum, two-way digital responders would need to be installed with the sets at each location, and a wide variety of programmed materials might be specially prepared for local use.*

The estimated costs of providing remedial materials by cable displayed in Table 6 include:

1) Cost of drop line to school building	$20/drop
2) One (or two) TV receivers for each school	250(b/w); 400(color)
3) One digital responder (for two-way use)	30 each
4) Allowance for materials preparation and/or tape rentals	10,000
5) Equipment maintenance	20/set/year

We assume that one of the remedial or special education instructors currently on the staff of the Trumann system could be reassigned to County-wide responsibilities for the video program. If this were not possible, an additional

* Videotape libraries such as the Great Plains National Instructional Television Library and the National Instructional Television Center lease films for rates that range from $35-$60 per hour. Most of this material is not interactive, however, and would have to be interspersed with questions and feedback testing provided by the Poinsett system to make full use of a two-way system.

Table 6

Estimated Costs of Applications for Remedial and Special Education

	Total County-Wide Costs*	
Capital Costs:	Minimum	Recommended
Drop to school building, @ $20	120.00	140.00
TV receivers (b/w @ $250, color @ $400)**	1500.00	4000.00
Digital response pad, $30	1800.00	3000.00
Subsidiary equipment at each site,$3065	18390.00	21455.00
Recurring Costs:		
Materials preparation and tape rentals,	10,000.00/yr	10,000.00/yr
Equipment maintenance, $20/yr/set	120.00/yr	140.00/yr
Additional staff position, $9,000	9,000.00/yr	9,000.00/yr
Total Out-of-Pocket Costs for Remedial and Special Education Use, Year 1	$40,930	$47,735
Average Annual Cost (amortizing capital expenditures over 5 years)	$23,482	$24,859
Average Annual Cost per Special Education Student***	$122.94	$130.15
Average Annual Cost per Remedial Student****	$23.13	$24.49
Average Annual Cost per Remedial and Special Education Student	$19.47	$20.61

*Minimum estimate based on 6 centers, one in each town school; recommended estimate based on 7 centers including a rural center to be located in the Common District.

**Minimum estimate assumes 6 sets, one per school district; recommended estimate assumes 10 sets, one each in Tyronza and Weiner and two each (one in the elementary school and one in the high school) in Harrisburg, Trumann, Lepanto, and Marked Tree.

***Based on the 1975-76 total of 191 special education students.

****Based on assumption that 15% of county students, or 1015, need some remedial attention.

recurring cost of about $9000 per year should be added to cover the salary of an additional video staff member.

It is evident that the adoption of two-way capacity (excluding trunk costs) is only marginally more costly than one-way use for these purposes, although it places a correspondingly greater responsibility on the video instructor for testing and evaluating feedback from the student. It should be noted here that significant gains may be made, especially in the elementary grades, by using the ordinary classroom teachers as extensions of the special education and remedial instruction staff in the individual schools so that programming should include not only lessons directed to the students, but perhaps periodic two-way conferences with teachers and parents as well. Indeed, there is some evidence that followup in the home is especially effective in reinforcing remedial work.

It is evident that, when capital costs are amortized over a five-year period, the marginal cost per additional student of the recommended system ($20-$130 per student per year) compares favorably with the current average expenditure of $1466 per year per special education student in the County. In addition, the system provides a means of reaching some of the students in need of remedial help who cannot currently be reached, through the addition of more special staff positions. Indeed, if capital costs of setting up such a system could be funded from outside sources, the "recommended" system would impose a recurring budgetary cost equal to .5% of the current annual payroll, or roughly two additional staff positions for the entire County.

Several caveats are in order here: (1) the use of the system as outlined above is not a substitute for any of the existing remedial and special education staff and, indeed, implies a willingness on the part of ordinary classroom teachers and teachers' aides to assist in the remedial programs. The capital costs estimated

* At its present expenditure rate of $1466/special education student, the marginal costs of this application would be covered if an additional 14 students were serviced by cable. Estimated benefits do not include any accruing to currently served special students.

above do not provide enough equipment to expose all students to long periods of individualized video programming. For this reason, and because there is ample evidence in the educational psychology literature that personal face-to-face instruction is always needed, we regard the proposed application primarily as a means of extending the school districts' existing resources rather than as a revolutionary change in teaching method or functions.

(2) Experimental uses of video instruction require experimental programming. Experience has demonstrated that the production of effective instructional programming is expensive, ranging from about $150/hour for low-quality to $3500/hour or more for high-quality instructional programming.* We have budgeted only $10,000 above for materials preparation and the rental of already existing programming on the assumption that Poinsett would do little original filming or direct software itself. We note that the local public education television station, Channel 2 in Conway, Arkansas, currently broadcasts some instructional materials prepared at the University of Central Arkansas. It would be particularly important to explore the possibility of enlisting the film and production skills of regional universities in Jonesboro, Conway, and Little Rock to expand the range of commercially taped materials with specifically local programming if possible. These costs are not included in the above estimates.**

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* For example, Maryland College of the Air reports production costs of $2200 per hour; Chicago TV College, $3900 per hour; and the Children's Television Workshop, $35,000 per hour for the carefully researched and tested Sesame Street series.

**Note that this is different from the viewpoint adopted by previous "technology feasibility" studies which have been concerned primarily with demonstrating the effectiveness of the medium for delivering services. Here we are concerned with assembling a set of commercial and public services whose paid use, together with subscriber revenues, can help to justify the investment cost of the system. For this purpose we must be less concerned with the experimental uses of the medium than with demonstrable cost-effective uses for which current users might well pay.

3. Adult and vocational education programs in Poinsett County are supported by the Arkansas State Department of Education with funds appropriated by the State legislature and supplemented by a variety of federal program funding. In fiscal year 1976-77, federal ($869,000) and state shares ($851,900) are nearly equal; no local matching is required from the individual school districts. In Poinsett County, general adult education and high school equivalency certificate programs are funded in Harrisburg (a part-time program), Marked Tree, Weiner, and LePanto (a part-time program). Marked Tree, Weiner, and LePanto also have vocational programs.

Of the total adult population 25 years and older in Poinsett, 76% or 10,909 are considered eligible for general education and high school equivalency programs by virtue of the fact that they have not completed high school.* The State Department of Education estimates that existing programs are reaching about 300 of these at an average expenditure of $35-$45/student/year.**

Adult educational programming is generally thought to be somewhat more cost-effective than cable transmission of remedial and special education programming for children on the assumption that viewing is voluntary and motivation higher, so that programming need not be as entertaining. However, adults viewing at home do not constitute a captive audience and viewing patterns may be erratic and interrupted by other responsibilities. It therefore seems desirable to use equipment installed in each of the six district schools for remedial and special education (as described in the previous section) to offer adult education viewing courses in the evenings in districts not currently offering full-time, live courses.

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* Forty-five percent of the adult population have less than an eighth grade education and 31% have more than an eighth grade but less than a high school education.

**Private communication from Ms. Marianne Crabtree, Administrative Asst. to the Director for Adult Education, Arkansas State Department of Education, 9/8/76.

If cable transmission of the adult education courses now offered in the County were to reach an additional 300 students, at the State Department of Education's current expenditure of $40 per student, this implies incremental benefits valued at at least $12,000 from this use alone.* Additional benefits would accrue if a County-wide cable system permitted the staff currently offering adult education courses to diversify the course offerings. Average class sizes are estimated to run 10-25 persons per class, so that a doubling of class size (as implied by the additional 300 students reached) would not be unwieldy, even where assigned work might need to be submitted to the instructor for comment and grading.

A similar line of reasoning can be followed in estimating the market for additional vocational education in the County. At present, there is a single full-time vocational school in Poinsett, Delta Vocational Technical School, located in Marked Tree. Additional vocational courses, taught by regular members of the school staff, are offered as part of the curricula in Trumann, LePanto, Tyronza, Harrisburg, and Weiner (served by a satellite of Cotton Bowl Vocational Technical School in Burdette, Mississippi). These in-school courses are confined to agriculture, home economics, and business practices, with Harrisburg also offering evening courses in welding and building trades. Students in these courses receive regular high school diplomas, except for the Delta School, which awards a vocational certificate.

The State Department of Education estimates that vocational courses cost $5000/teacher-unit/year in state and federal funds, which is roughly matched by another $5000/teacher-unit in local expenses, including in-kind contributions of space, light and heat, and materials. A teacher unit is estimated to serve about

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* This line of argument, of course, assumes that the State Department of Education's expenditures per student are a minimum measure of the social value of adult education and training in the State; additional private benefits are also enjoyed by users of these services but cannot easily be measured since residents have not been asked to pay for adult education courses in the past.

30 students per year so that estimated costs are roughly $333/student/year. Poinsett will have 21 teachers of vocational-technical courses in the coming year, so approximately 630 students will be served at a total cost of $210,000. It is more difficult to estimate the potential market for vocational training in the County because no preference surveys have been done, and students in the separate town school districts presumably have access to the two or three courses offered in each of the school curricula.

It would appear that the contribution of cabled vocational instruction might lie primarily with the adult, self-interest and hobby market, where home viewers could acquire information on home repairs, canning and food preparation, consumer buying tips, and the like. In Harrisburg, the district with the largest offerings, class enrollments run 10-20 (business practices), 15-20 (building trades), and 25-30 (welding). Using the more conservative of the two figures for courses of each type offered in the other school districts implies a potential interest group of some 300 across all six school districts, which, evaluated at the state's cost of $333/student, yields an estimated $99,900 in implied benefits from reaching these additional students by cable. We are reluctant, however, to put much faith in this kind of estimate since it really measures what it would cost the state and local school districts to service these additional individuals at the same level as high school vocational trainees, and it is not clear that this accurately measures either social or private benefits to this segment of the population.*

At the same time, the cost of providing current adult vocational courses on the system already in place for general adult education courses would be modest,

* Indeed, we are inclined to think that the marginal value of such self-interest instruction may be considerably lower than the $333 cost of in-school training, both because viewing is likely to be more casual and because these benefits are more specifically private than social. But again, because this training has been offered free to County residents, we do not have a reliable measure of willingness to pay on the part of individuals.

entailing primarily the cost of videotape ($40/half-hour lesson, or about $500 for a 12-week series). Since these courses do not lead to any formal certification, problems of testing and supervision would be nonexistent. However, it is necessary to note that since this is essentially a one-way use, it could be as expediently provided by ordinary broadcast television if free time were provided. Net benefits from vocational applications of the cable system, then, arise primarily from the excess capacity of the medium which enables free access to be provided compared to commercial broadcast time.

We exclude a fourth alternative, computer assisted instruction (CAI), as being far too capital-intensive and expensive for the number of students to be served or the financial resources available. Computer assisted instruction requires interactive terminals for students connected on line to a central computer on which programmed instructional material is stored. Students then use the terminal keyboard to respond to questions and move step by step through the programmed material at their own pace. Both the hardware and the software for CAI are expensive and have not been adopted on a substantial scale by even the largest school systems in the country. While this technology may some day be offered at much lower cost, we believe that CAI is an unrealistic use of a projected cable system in Poinsett County, at least for the next decade.*

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* For an extensive discussion of CAI costs and benefits, see Municipal Service Applications of Cable for Baltimore City (op. cit.), pp. 54-80 and Table 5, p. 85; and D. Jamison, P. Suppes, D. Fletcher, and R. Atkinson, "Cost and Performance of Computer-Assisted Instruction for Education of Disadvantaged," (mimeo, 1974). Our calculations for Baltimore (a much larger school system) indicated an average cost of $1845/year/terminal, or roughly $185/student/year, spreading a $2.5 million computer cost over 193,000 students.

Health Services Applications in Poinsett County

Improvement in accessibility to existing health services in and outside Poinsett County, as well as an increase in the levels and kinds of services offered within the County, are among the most clearly needed applications of a potential cable system serving the County. The County is currently served by four physicians, several of whom are themselves ailing or ready to retire, who provide basic general practice care from 9 to 5 on weekdays. At other times, residents must leave the County to seek medical assistance in Jonesboro or Cross County to the north. The County provides an ambulance service at an annual cost of $35,000 for emergency cases, virtually all of which are taken to hospitals outside Poinsett.* Poinsett has no hospital of its own but is served by two public health clinics in Harrisburg and Trumann which are staffed by registered nurses. These clinics provide limited general health services including immunizations, family planning and pre-natal care, chronic disease screening, child health care, and some dental surgical facilities. In this capacity these clinics also serve an important educational function. In addition, the County has long-term care facilities with 132 beds for care of the elderly and the chronically ill.**

The County also contains several equipped medical facilities which are unable to operate for lack of practitioners or failure to meet federal standards: LePanto has an equipped clinic, Harrisburg an equipped hospital, and Trumann a partially open clinic. The clinics in LePanto and Harrisburg are owned by local physicians who have indicated their willingness to lease them to new medical

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* Users of the ambulance service are billed $40 plus $.50 per mile for emergency services.

** These facilities provide roughly one physician per 3000 persons, one registered nurse per 3300 persons, one dentist per 5300 persons, and one physical therapist per 27,000 persons. In 1970, the County also had 3 optometrists and 18 pharmacists, but no occupational or medical therapist. (East Arkansas Planning and Development District, Poinsett County Profile, Section VII, March 1976).

practitioners on very lenient terms, but as yet adequate professional staff have not been found to open these facilities.

The existing clinic facilities, together with the existing public health nurses, several new physicians, and additional paramedical professionals, could form the skeleton of a telemedical system which would increase both the number and accessibility of health services to County residents. The most logical procedure would appear to be to link Craighead Memorial Hospital in Jonesboro to the operating clinics in Trumann and the dormant clinic facility in LePanto in Phase I, with an extension of the circuit to the dormant hospital facility in Harrisburg in Phase II or later, when professional staff can be found to staff it. This would require a full two-way, dedicated closed-loop trunk link totalling 24 miles, running from Trumann through Marked Tree to LePanto, with a microwave link over the 22-mile distance from Jonesboro to Trumann. In Phase II, the trunk link would be extended over the 20-mile distance from Trumann to Harrisburg. It might also be possible for physicians in other parts of the County to utilize two-way links from their offices to tie into the continuing education process at the Jonesboro hospital and for peer consultation, both attractive features in luring younger practitioners to the County.*

Capital costs of the Phase I link from Jonesboro through Trumann and Marked Tree to LePanto would consist of a prorated portion of the cost of the microwave link between the hospital and the headend in Trumann, a prorated share of the cost of 24 miles of supertrunk connecting Trumann to LePanto, and cameras and hardware required at each end of the link. Operating costs include the cost of

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*Unlike its predecessor institution, the new Craighead Memorial Hospital has agreed to admit Poinsett physicians to its staff and to permit them to practice in the hospital. This strengthens the interest of local practitioners in maintaining daily contact with the hospital staff, in availing themselves of seminars, consultations, and other opportunities to keep abreast of current medical procedures, and in viewing themselves as part of a regional health network, rather than as isolated country doctors.

videotape film (for recording selected cases, educational and instructional programming and the like), maintenance of equipment at each end of the link, and personnel costs for a registered public health nurse or paramedic to staff the currently closed facility in LePanto. These costs are detailed in Table 7.

The costs of connection of the dormant hospital facility in Harrisburg in Phase II will include a prorated portion of 24 miles of supertrunk, cameras and corollary hardware, videotape, maintenance expense, and the cost of at least one physician, two registered nurses, a secretary, a billing clerk/bookkeeper, and three custodial staff members.

Benefits of a Teleclinic Network

The teleclinic network described above provides increased services at an increased total cost. This is particularly evident where existing but unused clinic facilities are being brought into use by the availability of cable connections with a regional hospital facility and its staff in Jonesboro.*

Benefits to residents of the County would stem largely from time savings, greater accessibility to general medical care and health information, and the advantages of remote consultation with physicians for the screening and referral

* Tele-diagnosis in a number of experiments has proven viable and capable of providing smaller hospitals and remote locations with access to specialized equipment and personnel in larger institutions. One of the best known experiments with tele-diagnosis has been in force at the Massachusetts General Hospital in Boston for more than five years. There, the resources of the Bedford VA Hospital, Massachusetts General, and the Bullfinch Psychiatric Institute have been linked by two-way video and are used for surgical, psychiatric, neurological, and cardiac consultations, and drug and alcohol therapy. The system is in use 12-14 hours a day and includes a link to Logan Airport for emergency services.

A second well-publicized experiment was mounted by Mount Sinai School of Medicine in New York, which maintained a telecommunications link with an East Harlem pediatrics clinic. The equipment (about $75,000 worth) was donated by TelePrompter, and operating costs were financed with a federal grant. The system was abandoned at the expiration of the federal funding period. In general, the difficulties encountered in telemedical experiments have centered on arranging inter-institutional cooperation and on overcoming preconceived ideas about the impersonality of health care services, not on problems of technological feasibility.

Table 7

Total Costs of Teleclinic Network: Poinsett County
(excluding ordinary trunk and feeder costs)

Phase I: Link from Jonesboro Hospital to Trumann-Marked Tree-LePanto		
Capital Costs		
Microwave link* (Jonesboro to Trumann) (prorated with the two teleclinc channels charged for 20% of link costs)	$24,800	
Supertrunk* (Trumann-Marked Tree-LePanto) 24 miles @ $9023/mile (prorated)	43,310	
Cameras, 3 high-resolution TMC-2300 @ $6000 each (One each at Craighead Memorial Hospital, Trumann clinic, LePanto clinic)**	$18,000+	
Plus: 3 Sony GC-3 mobile carts @ $60 each	180+	
3 Sony 12-inch color monitors @ $595 each	1,785	
1 color cassette VTR @ $1495 (TVR-1550)	1,495	
		$89,570
Operating Costs		$ 13,080
Film: 96 Sony 15-minute color cassettes @ $11.25 each	1,080	
One registered public health nurse	10,000	
Maintenance, cameras and equipment	2,000+	
Average annual costs(capital costs amortized over five years)	$30,994	
Average annual costs per clinic (capital costs amortized over five years)	$15,497	

* These costs calculated to allocate 30% of total capital costs of microwave link to two-way public service users in proportion to their assigned channel capacities use.

**We assume that both clinics are adequately equipped with routine medical and office supplies and equipment.

\+ These costs would be shared with the County Social Service Centers after completion of Phase II of the system (see the following section).

Table 7 (continued)

Phase II: Link from Trumann to Harrisburg Hospital Facility

Capital Costs		
Microwave Link (Jonesboro-Trumann) (prorated for 10% of total cost)	$12,400	
Supertrunk* (Trumann-Harrisburg) 20 miles @ $9023/mile (prorated)	$18,406	
1 camera, high-resolution TMC-2300, @ $6,000	$ 6,000	
Plus: 1 Sony GC-3 video cart @ $60	60	
1 Sony 12-inch color monitor @ $595	595	
1 color cassette VTR (TVR-1550) @ $1495	1,495	
		$38,956
Operating Costs		$71,384
Film: 32 Sony 15-minute color cassettes (for recording consultations) @ $12 each	$ 384	
One physician @ $35,000	35,000	
Two registered nurses @ $10,000	20,000	
One secretary/bookkeeper @ $6,000	6,000	
Three Custodial staff @ $3,000	9,000	
Maintenance, cameras and equipment	1,000	
Average annual cost (capital costs amortized over five years)	$79,175	

*These costs calculated to allocate 30% of total capital costs of microwave link to two-way public service users in proportion to their assigned channel capacities use.
We assume that the existing hospital in Harrisburg is adequately equipped with medical and office supplies and equipment.

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of cases to other facilities. In essence, the existence of a backup professional staff at Jonesboro would permit the supervision of paramedical personnel at remote locations where routine care could be provided at a fraction of the cost of a fully staffed facility.

An important feature of such an arrangement would be the establishment of clear lines of responsibility for supervision of paramedical personnel in the clinics. It is not clear whether responsibility for clinic personnel in a tele-clinic network would rest most appropriately with the cooperating hospital, individual staff members of the hospital admitting board, or with the State Department of Public Health.*

Additional benefits might accrue to practitioners in the County whose own diagnostic resources are boosted by the ready availability of teleconsultation with colleagues in Jonesboro as well as from the possibility that a tele-clinic network may serve as an inducement to younger physicians to establish practices in Poinsett County. At the same time, the costs of these additional consulting services would be charged back to the patient or participating clinic, so that the price schedules for clinic services would reflect charges, if any, imposed by the Jonesboro hospital for the time its staff members spend servicing the remote clinics.**

While some reduction might also be expected in the direct cost of ambulance service to out-of-County facilities (currently costing the County $35,000 per year), that service could not be eliminated entirely, so that marginal savings in operating costs, on the order of 20 percent ($7000) might be effected by

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* At least two telephone satellite clinics, in Hot Springs and Fort Smith, Arkansas, operate under the sponsorship of individual physicians who take responsibility for the actions of paramedical personnel in the field.

**Robert Justus, Asst. Administrator of Craighead Memorial Hospital, has indicated that, while the hospital maintains no scheduled rates for such services, some fee, perhaps equivalent to the average outpatient fee of $30, would probably be imposed.

reducing the average distance travelled in search of emergency care.*

It should be noted that, while we have designed our prototype system to provide a dedicated two-way channel for tele-medical uses, many of the diagnostic functions performed in two-way video experiments to date could be carried on as well by one-way cable with telephone return. There is no compelling reason why the patient in a teleclinic, for example, needs to see the physician by return video, so that a variety of medical applications could be instituted or extended throughout the County as needs grew. Two-way capacity, however, may have important effects on patient acceptance, and permits staff in the remote clinics to observe procedures and demonstrations at the hospital and to communicate with each other across the County.

Public health information dissemination is a one-way use of cable capacity which could be accommodated as part of the regular "public interest" programming of the commercial channels on the system. Because effective, professional quality public information programming is expensive and is largely directed to audiences of low priority to commercial advertisers (making commercial sponsorship difficult to obtain), we have assumed that a demonstration system in Poinsett would do no public health programming of its own, depending instead on programming produced by the State Department of Health.** It should be noted, however, that widespread availability of public health information is frequently complementary to current medical care, designed to encourage people to make greater demands on the health services system (Have a chest X-ray; See your doctor for a physical once a year;

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* Records of the ambulance runs made in 1975 indicate that roughly 20% were for the kinds of care that might have been rendered at a local clinic facility had one been available and open. (Information provided by Kenneth LaGrone, Director of the Poinsett County Office of Emergency Services.)

** The expense of attractive public health programming is illustrated by experiences such as "Rx: Keeping Well," a weekly show produced by WTOP in Washington, using an interview format, which costs about $4000 per half-hour, and attracts 50,000 or more viewers in the Baltimore-Washington area; and "Feeling Good," a production of the Children's Television Workshop, which used a variety show format, cost in the neighborhood of $15,000 per half-hour segment, and had such low national viewing ratings that it was discontinued.

See your dentist twice a year). In this case, we might anticipate that increased availability of health information would generate additional demand for the services of the three clinics in the County.

The benefits of the teleclinic network outlined here lie primarily in the extension of services to individuals who might otherwise go untreated, and in the time savings to patients in the County. Since residents are currently receiving minimal in-County care, there can be few direct cost savings in the form of physicians' time, although the teleclinic network holds some opportunities for using the existing physicians more effectively and for assisting the effort to recruit younger practitioners to County locations. Since most of the benefits identified here are private, in the form of increased accessibility to care, it should not be anticipated that the teleclinic network would have any appreciable effect on the lowering of patient costs.

Consolidated Social Services

A third, but slightly more complex, application of cable in Poinsett County lies in the possibility of consolidating the eligibility and collection procedures for a variety of social benefits programs for the unemployed, the aging, and the sick, and using the telecommunications system to save travel time and expense for clients. Current social service programs in Poinsett are funded primarily by state and federal sources, but administered by the County Department of Social Services. This department, located in Harrisburg, administers:

Medicaid - About 25 applicants per month must be interviewed by a case worker in the Harrisburg office. Applicants come from all over the County.

AFDC (Aid to Families with Dependent Children) - Approximately 40 interviews per month. The current case load is about 600 recipients.

Foodstamps - About 600 persons per month must be interviewed. The current case load is 2000-3000.

Protection Services (child abuse) - Thirty-forty interviews per month.

All interviews are currently carried out face-to-face, a procedure that imposes substantial time and travel costs on poor, unemployed, or aged recipients, some of whom are thirty miles or more from Harrisburg. An exception is the Department's mobile unit for the sale of foodstamps, which circulates among the larger towns once each month.

Employment Security, on the other hand, is administered from Jonesboro, and the County's more than 1500 unemployed workers must travel to Jonesboro each month to establish their eligibility and to collect their benefits.*

* A large proportion of the present unemployment case load is composed of workers laid off at the closing of a large Singer plant in Trumann.

In addition, special services available to the elderly are provided under the auspices of the Crowley's Ridge Development Council, Inc., at locations in Harrisburg and Trumann. Services for the aging are discussed separately in a following section.

One possible approach to decentralizing these services would be to locate county government and administrative centers at video centers in several of the larger population centers, with two-way connection to a central office in Harrisburg and perhaps in Jonesboro. These centers would be staffed by a clerk, who would assist applicants in filling out the requisite forms and completing the routine paperwork for eligibility determination. The two-way video link could then be used to permit a case worker in the Department of Social Services in Harrisburg or at the Employment Security office in Jonesboro to interview the applicant, clarify items on the application forms, explain specific conditions and terms of the benefits programs, and so forth. Where referral to job counselling, health, or other social and community services seemed appropriate, this could also be supplied from the central office.

We would propose that such services be centralized at the teleclinics in Trumann, Harrisburg, and LePanto to share the cost of physical and video facilities, as well as some common staff such as receptionist and bookkeeper. This would entail the Department of Social Services' assigning at least two clerks from the Harrisburg office to the two remote clinic locations. For purposes of our subsequent cost estimates, we have assumed that one of these could be assigned from the existing staff in Harrisburg or freed from duties in some other part of the Department, and that the second would be a net cost to the project. This does not seem to be unreasonable, since the largest number of beneficiaries are located in the Trumann-Marked Tree-LePanto portion of the

County and the diversion of their traffic to the satellite centers should free a proportionate amount of staff time at the Harrisburg office. No additional staff should be required in the Jonesboro Employment Security office since the same staff will be processing the same volume of applicants, although from the remote locations instead of directly through office interviews. Indeed, some savings in time may eventually be realized as case workers learn to work more efficiently via the video link; however, the novelty of a new medium may counterbalance this effect in the first year or more.*

Because the network link to Harrisburg is not constructed until Phase II, there are two possible approaches to implementing a consolidation of social services by telecommunications: county service centers could be established at the clinics in Trumann and LePanto during Phase I, with microwave connection of each satellite center to Harrisburg; or the consolidation could be postponed until the full county-wide system is constructed in Phase II. Special connection by microwave would be costly, adding some $50,000+ to the initial capital costs of Phase I, all of which would be specifically chargeable to this particular use of the system. When Phase II is built this investment becomes obsolete, since all towns would then be fully interconnected by supertrunk. For this reason, we suggest such social service usage of the system as a planned application for Phase II of a demonstration system. Table 8 following displays the estimated capital and operating costs of two consolidated social service centers in Trumann and LePanto and equipment for the Harrisburg site to be established in Phase II.

It is possible that the health-social services centers could also be

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* It has been suggested by personnel in the Poinsett County Department of Social Services that current regulations requiring face-to-face interviews would have to be clarified to permit video interviewing. This should certainly be explored with state personnel in more specific planning for any demonstration system.

Table 8

Estimated Costs of Consolidated Social Service Centers

Trumann, LePanto, Harrisburg

Capital Costs	
One-half of cost of:	
video camera (2)	$3000/location
monitor(2)	300/location
Full cost of:	
video camera & monitor(Harrisburg)(1)	6600/location
filing cabinets, desk, typewriter, and miscellaneous office supplies (2)	2500/location
teletype terminal for transmission of hardcopy records to central office(3)	1000/location
additional link to Employment Security office from microwave tower at hospital(1)*	3000
Operating Costs	
One Dept. of Social Services clerk*	8000/year
Maintenance, cameras and equipment(3)	1000/year/location
Average annual costs (amortizing capital costs over five years, for three locations)	$ 15,840
Average annual costs/location (amortizing capital costs over five years)	5,280

Note: We assume that the Harrisburg central office has sufficient office equipment but would require a video camera, monitor, and teletype which could not be shared with a teleclinic. Camera and monitor costs for the centers in LePanto and Trumann are shared with their respective clinics; maintenance for all cameras and equipment is shared three ways.

* These costs prorated across three locations.

developed into community facilities centers by incorporating other activities with and without the assistance of the broadband network. For instance, the town of Trumann recently hired an arts and crafts director to run a program for senior citizens; it is possible that his services could be shared by residents of other communities using the cable links to other centers. With time, the County might also experiment with decentralizing other routine county government functions such as inquiries to the tax assessor's office, issuing permits and licenses, and the like.

Services to the Elderly

A particular reason for co-locating the social service centers and the teleclinics focuses on the state's special concern with the expansion of services to the elderly. Arkansas has the second largest percentage of population over 65 (20%), second only to Florida, and has identified this as a growth area in its budget. At present, services to the aging, including information and referral, transportation and escort service, nutrition, shopping assistance, counselling, and adult education, are provided in Trumann and Harrisburg by contract with the Crowley's Ridge Development Council, Inc.

The East Arkansas Planning and Development District, within whose jurisdiction Poinsett County falls, is actively planning a series of workshops and classes for the elderly and those who serve them, in cooperation with Arkansas State University. Their focus is on a variety of topics, including legal services for the aging, social security problems, personal hygiene, and physical fitness. Particular emphasis is laid on helping the aged to stay in their own homes as long as possible. Participants in the classes are equally divided between service workers and senior citizens, and sessions are videotaped for retransmission over the local (Jonesboro) network station when

time is made available.*

While to date this has been a limited one-way educational extension service, the consolidation of county social service centers with the teleclinics should provide a focus for the generation of new ideas and topics, and the cable network a regular outlet for programming directly addressing the needs of the elderly.

As in the health services applications discussed earlier, most of the benefits from consolidated social services centers would arise from increases in services to individuals not currently reached and from time savings to those now served. The poor, the elderly, and the unemployed would find it more convenient and less costly to apply for benefits and this might result in increases in the cost of such programs in Poinsett County as funded by state and federal agencies. Time savings to these recipients may have substantial personal value, but represent a rather low social opportunity cost. Increased administrative efficiencies, if any, could be offset at least in part by increases in case loads, so that direct cost savings to the County are unlikely on any large scale. Rather, the benefits of such social service centers would have to be seen by the County as coming primarily in the increased coverage of residents by programs for which they are legitimately eligible, and in improvements in the quality and completeness of services provided to clients.

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* Telephone communication with Lorin Ivener, staff member at the East Arkansas Planning and Development District. He has indicated that the EAPDD is committed to this effort and would be anxious to have operating responsibility for an experimental program if a demonstration system were constructed.

V. FINANCIAL OUTPUT TABLES: POINSETT COUNTY

Balance Sheet
Income Statement
Cash Flow Statement
Payroll Table

JOHNS HOPKINS CABLE STUDY MODEL

POINSETT COUNTY: BALANCE SHEET (ASSETS) ($1000)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
CASH	10.00	10.14	10.48	12.30	13.10	6.76	6.92	7.42	7.61	7.80
SHORT TERM INVESTMENTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ACCTS RECEIVABLE-SUBSCRIBERS	9.33	13.36	14.92	18.22	20.52	21.74	22.36	22.89	23.37	23.82
OTHER RECEIVABLES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INVENTORY	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
PREPAID EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER PREPAID EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CURRENT ASSETS	29.33	33.50	35.40	40.52	43.62	38.49	39.28	40.31	40.97	41.62
LAND	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
BUILDINGS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEADEND	190.31	177.19	164.06	150.94	137.81	124.69	111.56	98.44	85.31	72.19
ORIGINATION EQUIPMENT	3.80	3.40	3.00	2.60	2.20	1.80	1.40	1.00	0.60	0.20
MOBILE EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STUDIO EQUIPMENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FURNITURE + FIXTURES	4.75	4.25	3.75	3.25	2.75	2.25	1.75	1.25	0.75	0.25
TRUNK + DISTRIBUTION SYSTEM	305.03	394.34	408.51	578.47	680.08	690.50	638.48	585.90	532.75	479.04
VEHICLES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TEST EQUIPMENT	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50
LEASEHOLD IMPROVEMENTS	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50
CONSTRUCTION IN PROGRESS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER FIXED ASSETS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL FIXED ASSETS	526.89	600.18	598.32	752.26	837.84	832.23	764.19	695.59	626.42	556.68
INTANGIBLE ASSETS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DEFERRED CHARGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORGANIZATION EXPENSE	19.00	17.00	15.00	13.00	11.00	9.00	7.00	5.00	3.00	1.00
DEFERRED DEVELOPMENT EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER ASSETS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER ASSETS	19.00	17.00	15.00	13.00	11.00	9.00	7.00	5.00	3.00	1.00
TOTAL ASSETS	575.22	650.68	648.72	805.78	892.46	879.73	810.47	740.90	670.39	599.30

12. 1.75

DISTRICT(S) 8
TABLE 1
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JOHNS HOPKINS CABLE STUDY MODEL

POINSETT COUNTY: BALANCE SHEET (LIABILITIES) ($1000)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
ACCOUNTS PAYABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOANS PAYABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *
SUBSCRIBER ADVANCES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TAXES AND OTHER WITHHOLDINGS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *
ACCRUED EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *
ACCRUED TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *
DIVIDENDS PAYABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OTHER CURRENT LIABILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CURRENT LIABILITIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DEFERRED CREDITS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL DEFERRED CREDITS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LONG TERM DEBTS	656.11	772.33	795.89	981.98	1090.87	1096.00	1042.44	989.07	934.73	880.33
TOTAL LONG TERM DEBT	656.11	772.33	795.89	981.98	1090.87	1096.00	1042.44	989.07	934.73	880.33
TOTAL CREDITOR-S EQUITY	656.11	772.33	795.89	981.98	1090.87	1096.00	1042.44	995.36	947.35	899.33
COMMON STOCK-ISSUED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(TREASURY STOCK-COMMON)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PREFERRED STOCK-ISSUED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(TREASURY STOCK-PREFEPRED)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ADDITIONAL PAID-IN CAPITAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONTRIBUTED CAPITAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RET. EARNINGS(PRIOR)RESTR.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RET. EARNINGS(PRIOR)UNRESTR.	0.00	(80.89)	(121.65)	(147.16)	(176.20)	(198.41)	(216.28)	(231.97)	(248.18)	(264.35)
RET. EARNINGS(CURRENT)RESTR.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RET. EARNINGS(CURRENT)UNRESTR.	(80.89)	(40.76)	(25.51)	(29.04)	(22.21)	(17.87)	(15.69)	(16.21)	(16.17)	(16.69)
RETAINED EARNINGS	(80.89)	(121.65)	(147.16)	(176.20)	(198.41)	(216.28)	(231.97)	(248.18)	(264.35)	(281.04)
OTHER STOCKHOLDERS EQUITY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL OWNER-S EQUITY	(80.89)	(121.65)	(147.16)	(176.20)	(198.41)	(216.28)	(231.97)	(248.18)	(264.35)	(281.04)
TOTAL EQUITY	575.22	650.68	648.72	805.78	892.46	879.73	810.47	740.90	670.39	599.30

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DISTRICT(S) 8
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JOHNS HOPKINS CABLE STUDY MODEL

POINSETT COUNTY: INCOME STATEMENT ($1000)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	
SERVICE INCOME	46.93	112.37	137.20	160.64	188.13	204.76	213.50	219.21	224.32	229.05	
INSTALLATION INCOME	10.53	5.28	3.35	5.10	4.27	3.42	2.95	2.89	2.84	2.81	
OTHER OPERATING INCOME	3.68	8.67	10.41	11.96	13.74	14.67	15.00	15.11	15.16	15.18	
TOTAL OPERATING INCOME	61.14	126.32	150.96	177.70	206.14	222.85	231.45	237.20	242.31	247.04	
INTEREST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DIVIDENDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MISCELLANEOUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL OTHER INCOME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL REVENUES	61.14	126.32	150.96	177.70	206.14	222.85	231.45	237.20	242.31	247.04	55
SERVICE EXPENSES	69.27	67.34	69.76	86.06	91.45	94.65	97.08	100.38	103.03	105.57	*
PROGRAM ORIGINATION EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
GENERAL+ADMINISTRATIVE EXPENSE	44.85	47.88	49.87	53.88	57.50	59.86	62.54	65.07	66.87	68.97	*
DEPRECIATION + AMORTIZATION	19.53	42.87	48.15	56.57	68.60	75.95	78.51	79.07	79.64	80.20	*
INTEREST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TAXES	8.39	9.00	8.69	10.22	10.80	10.26	9.01	8.89	8.94	8.99	*
MISCELLANEOUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OTHER OPERATING EXPENSES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL EXPENSES	142.03	167.08	176.47	206.74	228.35	240.72	247.14	253.41	258.48	263.73	
PRE-TAX INCOME (LOSS)	(80.89)	(40.76)	(25.51)	(29.04)	(22.21)	(17.87)	(15.69)	(16.21)	(16.17)	(16.69)	80
STATE INCOME TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FEDERAL INCOME TAXES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

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JOHNS HOPKINS CABLE STUDY MODEL

POINSETT COUNTY: CASH FLOW STATEMENT

($1000)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	
SERVICE INCOME	46.93	112.37	137.20	160.64	188.13	204.76	213.50	219.21	224.32	229.05	
OTHER OPERATING INCOME	3.68	8.67	10.41	11.96	13.74	14.67	15.00	15.11	15.16	15.18	
ACCOUNTS RECEIVABLE SUBSCRIBER	9.56	13.70	15.30	18.69	21.05	22.29	22.94	23.48	23.97	24.43	
DOUBTFUL ACCOUNTS	0.76	1.82	2.21	2.59	3.03	3.29	3.43	3.51	3.59	3.66	
ACCTS REC PREVIOUS	0.00	9.33	13.36	14.92	18.22	20.52	21.74	22.36	22.89	23.37	*
ALLOW FOR DOUBT ACCT (SC)	0.23	0.34	0.38	0.46	0.52	0.56	0.57	0.59	0.60	0.61	*
CASH SERVICE INCOME	40.52	115.19	143.84	166.70	196.55	214.92	224.45	230.27	235.41	240.11	*
INSTALLATION INCOME	10.53	5.28	3.35	5.10	4.27	3.42	2.95	2.89	2.84	2.81	
TOTAL SOURCES OF CASH	51.05	120.48	147.19	171.80	200.82	218.35	227.40	233.16	238.25	242.93	*
C E INVENTORY	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E PREPAID EXP.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E LAND	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E BUILDINGS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E HEADEND	196.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E ORIGINATION EQUIP	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E MODULE EQUIP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E STUDIO EQUIP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E FURNITURE AND FIXTURES	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E TRUNK AND DISTRIBUTION	315.55	114.16	44.29	208.51	152.18	68.34	8.47	8.47	8.47	8.47	*
C E VEHICLES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E TEST EQUIP	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E INTANGIBLE ASSETS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E DEFERRED CHARGES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E ORIGINATION EXPENSE	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E OTHER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E DEF. DEV. EXP.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
C E TOTAL CAPITAL EXPEND	575.42	114.16	44.29	208.51	152.18	68.34	8.47	8.47	8.47	8.47	*
CASH OPERATING EXPENSES	121.74	122.40	126.11	147.58	156.72	161.48	165.21	164.82	175.25	179.86	*
PAYMENT OF ACCRUED TAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
ADDITION TO CASH BASE	10.00	0.14	0.34	1.81	0.80	(6.34)	0.16	0.50	0.19	0.20	*
TOTAL USES OF CASH	707.16	236.70	170.74	357.90	309.71	223.48	173.83	179.79	183.91	188.53	*
CASH FLOW	(656.11)	(116.22)	(23.56)	(186.09)	(108.89)	(5.13)	53.56	53.37	54.34	54.40	*
CUMULATIVE CASH FLOW	(656.11)	(772.33)	(795.89)	(981.98)	(1090.87)	(1096.00)	(1042.44)	(989.07)	(934.73)	(880.33)	*

JOHNS HOPKINS CABLE STUDY MODEL

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POINSETT COUNTY: PAYROLL TABLE SYSTEM PERSONNEL

	1	2	3	4	5	6	7	8	9	10	1-10
INSTALLER	18600.	7560.	7560.	7560.	7560.	7560.	7560.	7560.	7560.	7560.	86640.
SERVICE TECHNICIAN	10241.	8568.	8568.	16440.	17136.	17136.	17136.	17136.	17136.	17136.	146632.
GENERAL MGR	13650.	14333.	15049.	15802.	16592.	17421.	18292.	19207.	20167.	21176.	171688.
SECRETARY	6300.	6615.	6946.	7293.	7658.	8041.	8443.	8865.	9308.	9773.	79241.
BILLING CLERK	6300.	6615.	6946.	7293.	7658.	8041.	8443.	8865.	9308.	9773.	79241.
BENCH & MICRO-WAVE TECH	11550.	12128.	12734.	13371.	14039.	14741.	15478.	16252.	17065.	17918.	145275.
TOTAL	66640.	55818.	57802.	67758.	70642.	72940.	75352.	77885.	80544.	83336.	708716.

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DISTRICT(S) 1
TABLE 1
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JOHNS HOPKINS CABLE STUDY MODEL

POINSETT COUNTY: CAPITAL PLANT INFORMATION ($1000)

		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
DISTRICT 1	1000 FT AC TRUNK	148.37	204.18	221.50	330.00	399.72	426.80	426.80	426.80	426.80	426.80
DISTRICT 2	1000 FT AC TRUNK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 3	1000 FT AC TRUNK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 4	1000 FT AC TRUNK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 5	1000 FT AC TRUNK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 6	1000 FT AC TRUNK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SYSTEM	1000 FT AC TRUNK	148.37	204.18	221.50	330.00	399.72	426.80	426.80	426.80	426.80	426.80
DISTRICT 1	1000 FT AC FEEDER	108.80	140.55	151.90	195.90	225.15	237.90	237.90	237.90	237.90	237.90
DISTRICT 2	1000 FT AC FEEDER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 3	1000 FT AC FEEDER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 4	1000 FT AC FEEDER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 5	1000 FT AC FEEDER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DISTRICT 6	1000 FT AC FEEDER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SYSTEM	1000 FT AC FEEDER	108.80	140.55	151.90	195.90	225.15	237.90	237.90	237.90	237.90	237.90
SYSTEM INSTALLERS		2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SYSTEM VEHICLES		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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VI. TECHNICAL APPENDICES
POINSETT COUNTY REPORT

#1. Headend and Tower Design: Component Equipment Costs
Schematic Layout of Poinsett System
Required Equipment at Jonesboro Tower Site
Required Equipment at Trumann Tower Site: Microwave Link
Broadcast Signals
Tower
Headend
Required Equipment at Each Service Installation for 2-Way Use

#2. List of Signals Carried on Poinsett Cable System

#3. Distribution System: Design and Component Costs

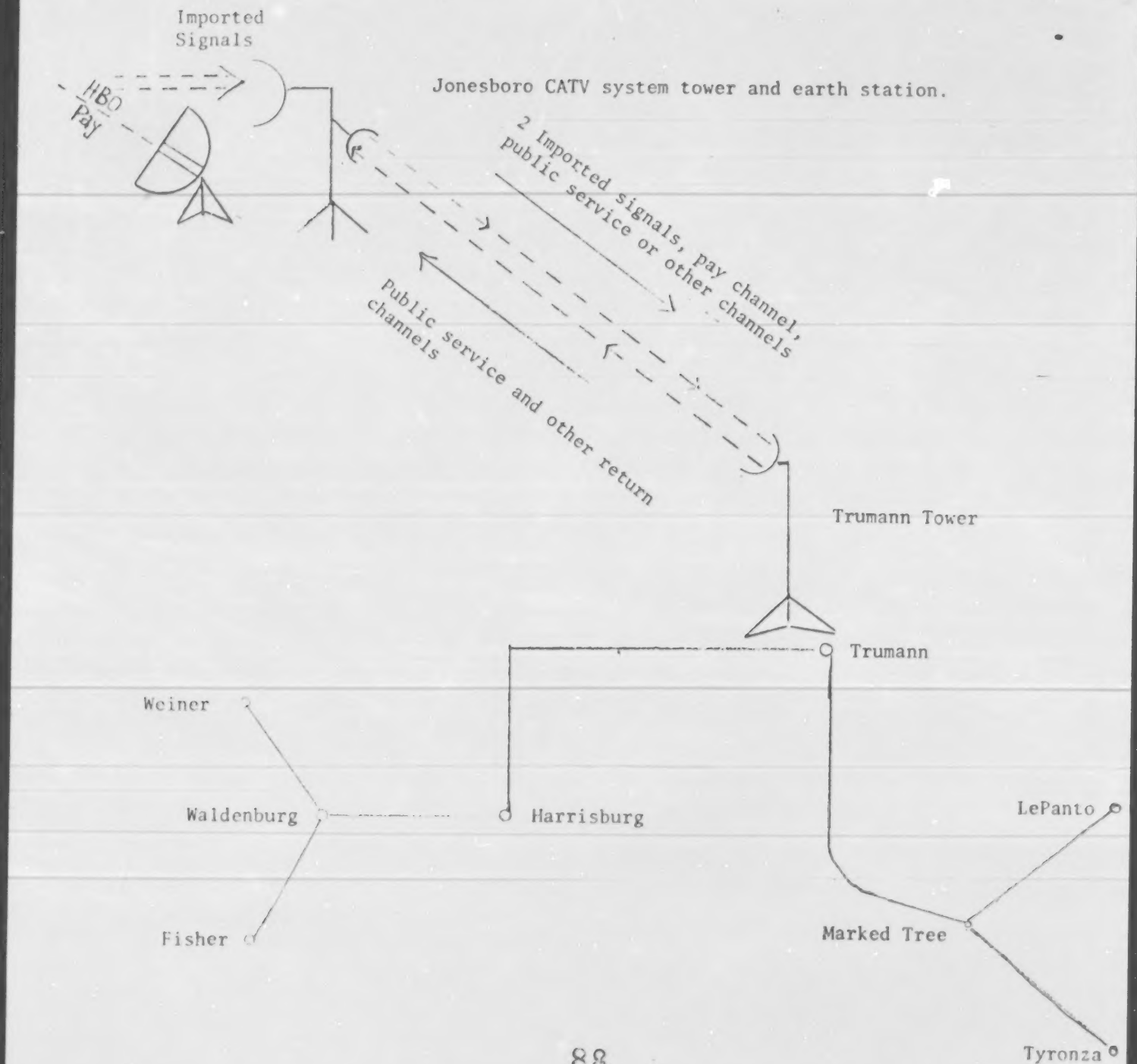
#4. System Personnel and Payroll

#5. Detailed System Design Maps (Not included in Conference copies):
Trumann, Marked Tree, LePanto, Tyronza, Harrisburg, Waldenburg, Weiner, Fisher, plus County-wide map showing supertrunk routing.

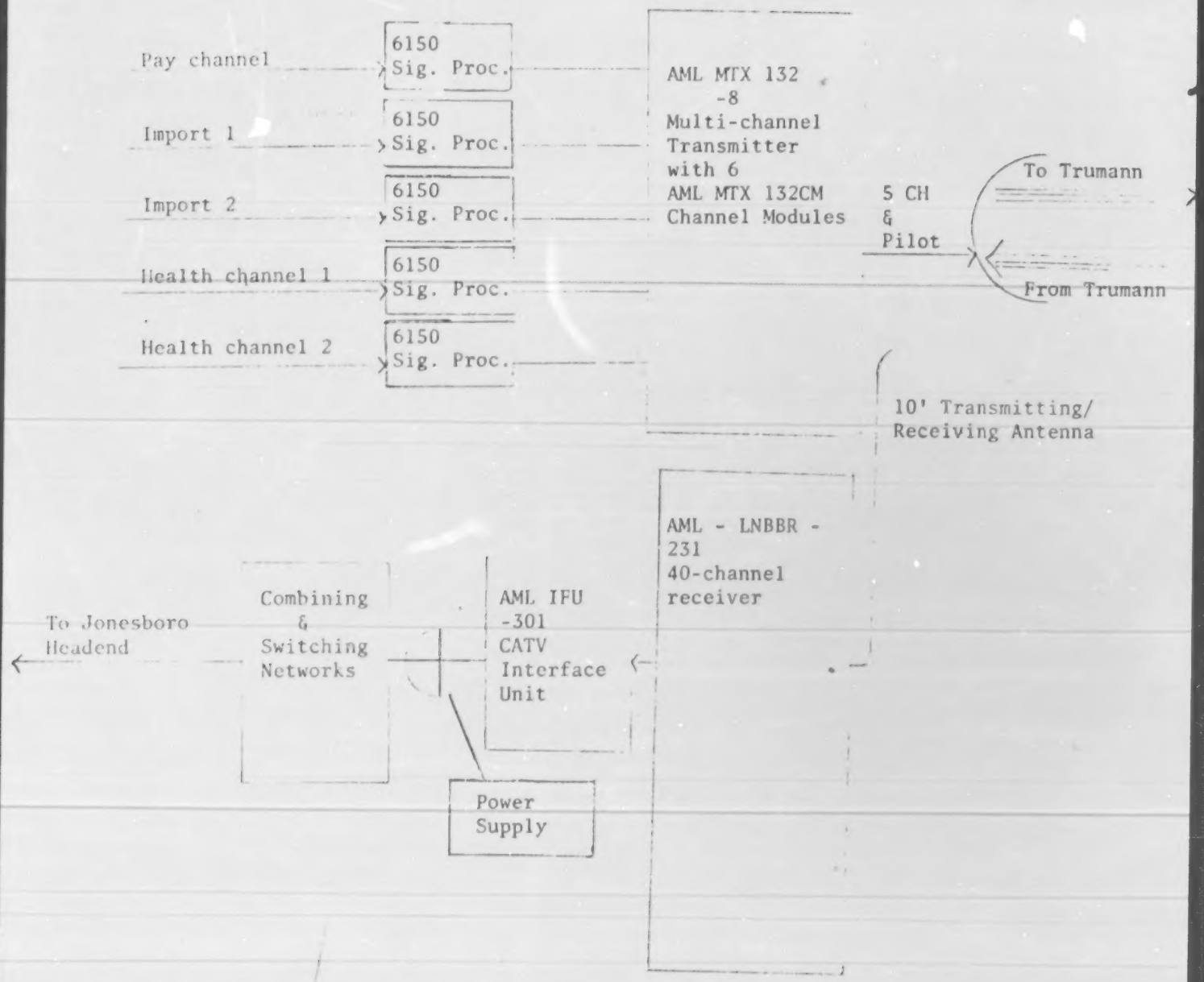
#6. Cost Comparison of Supertrunk and Microwave Links

#1. Headend and Tower Design: Component Equipment Costs

Schematic Layout of Poinsett County System



Poinsett County system:
Equipment Required at Jonesboro Tower Site



Component Itemization

5 - Scientific Atlanta 6150 Signal Processors @ $1320	$ 6,600
1 - AML MTX 132 Multichannel Transmitter Rack	15,697
6 - AML MTX 132 CM-Channel Modules @ $3410	20,460
1 - AML LNBBR 231 40 Channel Receiver	9,295
1 - AML IFU-301 CATV Interface Unit	1,320
1 - Jerrold Power Supply for Receiving Unit	1,310
Installation and Testing	8,000
1 - 10' Microwave Dish with Wave Guide, including installation and aiming	5,000
TOTAL COST* at Jonesboro Tower Site (Charged to #40)	$67,682

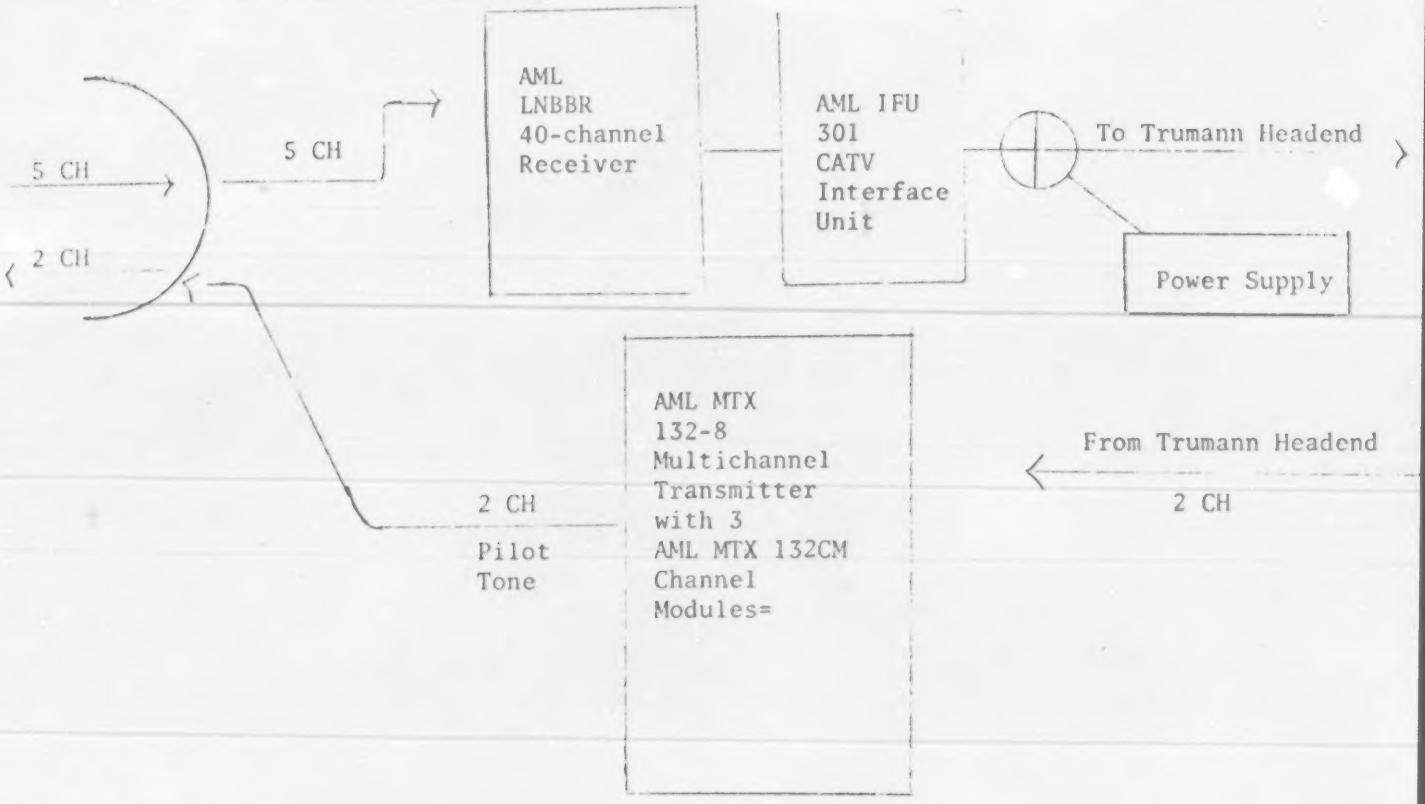
* This cost does not include any rents which the Jonesboro CATV operator might extract for use of his tower, system, and imported and pay signals. It also does not include the direct cost of any headend or line modifications required in the Jonesboro cable system to handle this increased capacity. Such modifications might include additional processors at the headend and amplifiers to convert the necessary links between the tower, headend, and public service sites (hospital, etc.) to two-way links.

These costs are not excluded because they are unimportant but because they are indeterminate at the present time. More details of the existing Jonesboro system must be obtained before these costs can be estimated.

For similar reasons, the cost of the switching and combining networks that process the microwave signals coming into Jonesboro have not been included in the above tabulation. These costs depend upon both the structure of the existing Jonesboro system and the total number of channels coming into the Jonesboro receiver.

Poinsett County system:
Equipment Required at Trumann Tower Site

For Jonesboro Microwave Link

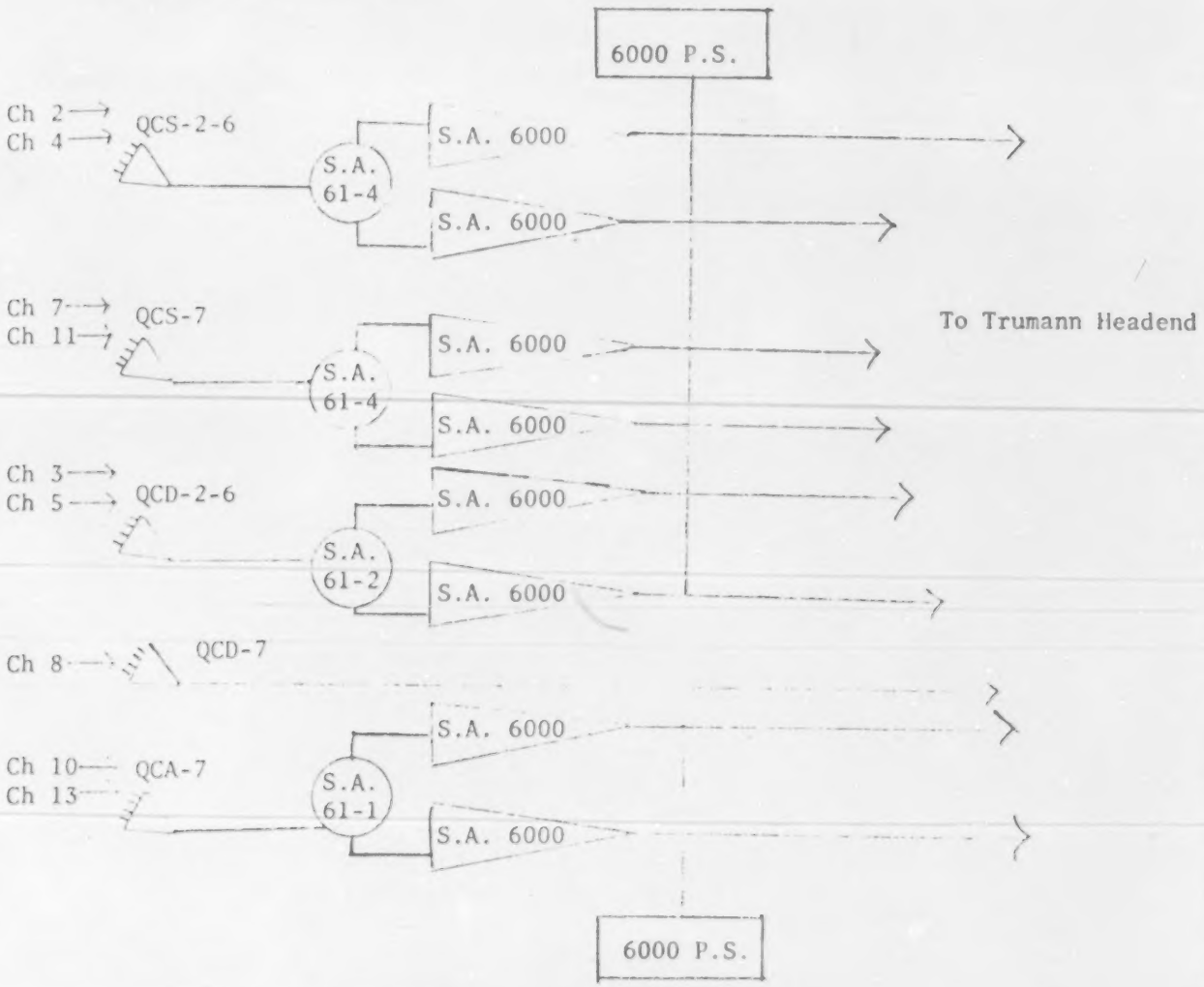


Component Itemization

1 - AML MTX 132 Multichannel Transmitter Rack	$ 15,697
3 - AML MTX 132 CM Channel Modules @ $3410	10,230
1 - AML LN3BR 231 40-channel Receiver	9,295
1 - AML IFU 301 CATV Interface	1,320
1 - Jerrold Power Supply for Receiving Unit	1,310
1 - 10' Microwave Dish with Wave Guide, including Installation and Aiming	5,000
Installation and Testing of Equipment	8,000
TOTAL MICROWAVE LINK COST AT TRUMANN (Charged to #40)	$ 50,852

Equipment at Trumann Tower Site (continued)

For Broadcast Signal Reception



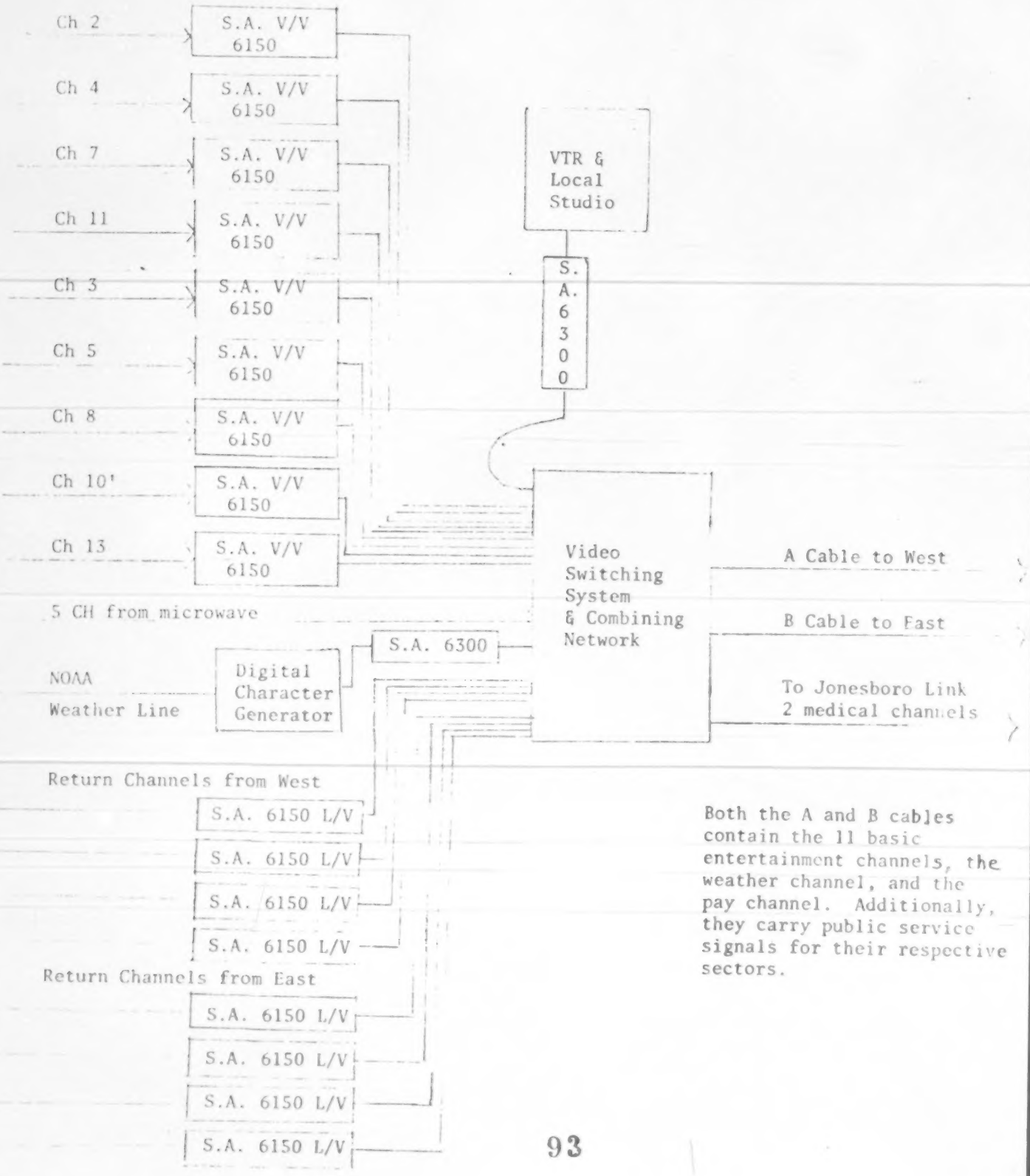
Component Itemization

1 -	Scientific Atlanta QCS-2-6 antenna	$ 2,165
1 -	" " QCS-7 antenna	1,810
1 -	" " QCD-2-6 antenna	1,160
1 -	" " QCD-7 antenna	935
1 -	" " QCA-7 antenna	425
8 -	" " 6000 VHF preamps @ $260	2,080
2 -	" " 6000 power supplies @ $175	350
1 -	" " 64-1 T-harness	50
1 -	" " 64-2 " "	55
2 -	" " 64-3 " " @ $60	120

Total Cost Broadcast Reception Equipment at Trumann Tower Site $ 9,150
(Charged to #34)

Equipment Required at Trumann Tower Site (continued)

Headend Equipment



Both the A and B cables contain the 11 basic entertainment channels, the weather channel, and the pay channel. Additionally, they carry public service signals for their respective sectors.

Equipment Required at Trumann Tower Site (continued)

Headend Equipment

Component Itemization

9 - S.A. 6150 Signal Processors, VHF to VHF, @ $1320	$ 11,880
6 - S.A. 6150 Signal Processors, L Band to VHF @ $1675	10,050
1 - Digital Character Generator (MSI 2100-B)	9,000
1 - Video Switching and Combining System	10,000
2 - Scientific Atlanta 6300 Modulator @ $ 1380	2,760
Miscellaneous Parts and Installation	4,500
Total Headend Equipment (Charged to #37)	$ 48,190

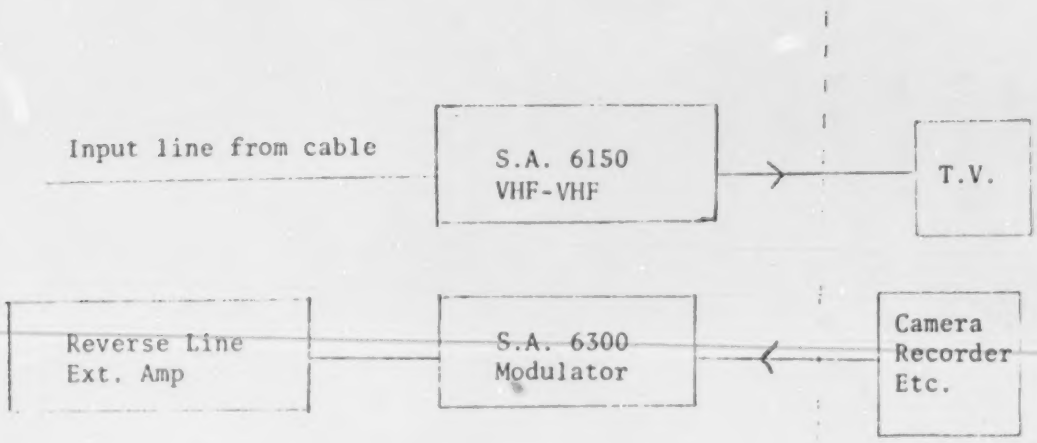
Note: The above itemization does not include studio and UTR costs, which are itemized elsewhere.

Equipment Required at Trumann Tower Site (continued)

For Tower

(#29)	Land for tower	$ 4,000
(#33)	200' guyed tower (installed)	15,000
	Installation cost of broadcast antennas and equipment	6,000
	Total Tower Site Cost	$25,000

Poinsett County system:
Equipment Required at Each Service Installation in Order to Utilize 2-Way



Itemization

1 - S.A. 6150 VHF-VHF Processor	$ 1,320
1 - S.A. 6300 Modulator (Sub low)	1,620
1 - Reverse Line Extender Amp	.125
TOTAL	$ 3,065

#2. List of Signals Carried on Poinsett County Simulated System

The following signals are assumed to be carried on the simulated Poinsett County demonstration system. (Numbering is not indicative of channel assignments.)

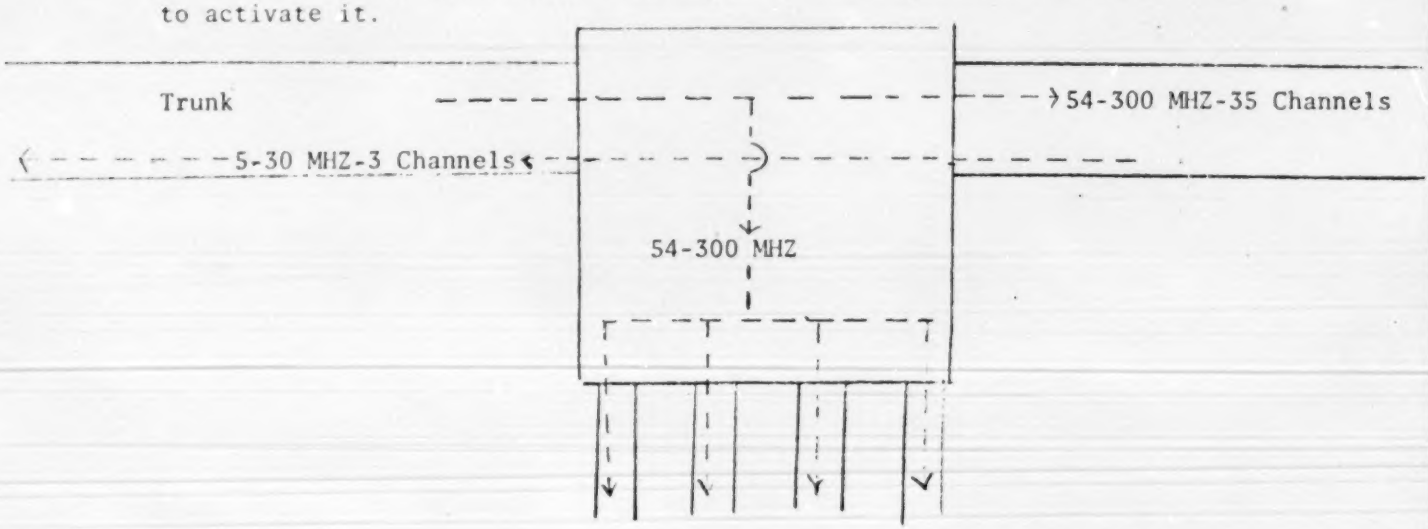
1)	WTEC-TV	(3)	CBS	Memphis	Available to all cable subscribers with ordinary TV receiver.
2)	WMC-TV	(5)	NBC	Memphis	
3)	KAIT-TV	(8)	ABC	Jonesboro	
4)	WKNO-TV	(10)	E	Memphis	
5)	WHBQ-TV	(13)	ABC	Memphis	
6)	KETS-TV	(2)	E	Little Rock	
7)	KARK-TV	(4)	NBC	Little Rock	
8)	KATV	(7)	ABC	Little Rock	
9)	KTHV	(11)	CBS	Little Rock	
10)	2 imported independents				
11)					
12)	Weather				
13)	Pay channel				
14)	Tele-clinic channel (Trumann to LePanto)				
15)	Tele-clinic channel (Trumann to Harrisburg)				
16)	Social services channel				
17)	Education channel (for use by the public school system)				
18)	Available for lease.				
19)					
20)					
21)					
22)					
23)					
24)					
25)					
26)					
27)					

#3. Distribution System: Design and Component Costs

Poinsett County

Component Cost Estimation for Local Distribution System -
Cases B & D (The Sub-Split Options)

Single trunk/single feeder subsplit system with activated 2-way capability in trunk. Feeder system has 2-way capacity but requires an additional module to activate it.



The Components are as follows:

W 4) Trunk Amp - AGC
W 5) Trunk Amp - ASC

Scientific Atlanta Model 6542 ARA
"Trunk with automatic control and reverse trunk amplifier" has AGC/ASC on both forward and reverse amps.

Specs: 54-300 MHZ
21 DB Gain

	$ 1427
less bulk discount	(143)
pads, clips, splices, miscellaneous	15
	$ 1299

W 7) Trunk & Bridger Amp AGC
W 8) Trunk & Bridger Amp ASC

Scientific Atlanta 6542 ARB
"Trunk - High output level bridging amplifier with automatic control and reverse trunk amplifier

	$ 1712
Less discount	(172)
Pads, clips, splices, miscellaneous	15
	$ 1555

Specs: 54-300 MHZ
21 DB Gain

W 9) Bridger Amp — Scientific Atlanta 6543 CBX
"Intermediate/Terminating High output level bridging amplifier with reverse through return cable."

	$ 960.00
Less discount	(96.00)
Pads, clips, splices, miscellaneous	20.00
	$ 884.00

Specs: 54-300 MHZ
34 db to feeder

W 10) Line Extender — Scientific Atlanta 6552
"Automatic Gain Control - standard level, tilt-compensated line extender." One way model but requires only one additional module to convert to 2-way.

	$ 410.00
Less discount	(41.00)
Clips, splices, etc.	5.00
Installation	3.00
	$ 377.00

Specs: 54-300
24 db gain

W 12) Four Way Tap — The input for this does not include a pay filter trap since it is installed as part of drop line.

Tap - Jerrold PBB4-500 tap with 2 (feeder) converters	$ 9.98
+2 terminating registers for unused ports - Jerrold TR75F	.64
Miscellaneous	2.00
Installation Cost	3.00
	$ 15.62

Tap Specifications:

T.V.:	10	13	16	20	25	31
IL	3.8	1.6	1.2	.6	.4	.4

W 13) Splitter (feeder) C - COR SM-Z 2-way splitter

W 14) Splitter (trunk) Price from 1973 catalog without effect of bulk discount

	$ 21.95
2 Jerrold VSF 500 RS Connectors	5.50
Installation cost	7.00
Reverse Pilot Notch Filters (trunk only)	[16.00]

Specs: Both outlets down 3.5 DB

W 13 Feeder	$ 34.45
W 14 Trunk	50.45

W 15)	Power Supply (includes standby capability)	Jerrold EMNB 114-HTR, includes standby power supply, SPS 30/60A power supply, heater for batteries and cabinet, with space for 8 battery cells	$ 880.00
		8 Jerrold GC 12200-A Gel cells @ $47 ea.	376.00
		Jerrold SPJ-3C Cable power inserter	29.00
		Miscellaneous splices, brackets, etc.	15.00
		Installation costs	10.00
			$1310.00

Equipment Price Sources for Poinsett System

Scientific Atlanta - November 1975 price list. Assumes that all purchases would be at 10% discount.

C-Cor Electronics Inc. - 1973 price list and catalog.

Jerrold Electronics Corporation - September 1974 price schedule.

Cable T.V. Supply Company - 1975 price list and catalog.

#4 Personnel for Poinsett

Single Headend Subscribers: 1800-2300

Title	# Persons	Salar,/Person
General Manager	1	$ 13,000
Secretary	1	6,000
Billing Clerk	1	6,000
Bench and Microwave Technician	1	11,000
Total Permanent Payroll		36,000

Plus: Calculated charges for time of installers and service technicians (see Payroll table printout, preceding)

Note: Janitorial services are included in space rental charges. The above are the anticipated permanent staff required to operate the Countywide system. Personnel required by specific commercial and non-commercial uses of the system are charged as expenses of those applications. For example, additional personnel necessary to prepare remedial and adult education materials are charged to the costs of those applications as outlined in the social services section.

#6. Cost Comparison of Supertrunk and Microwave Links;Poinsett System

SUPERTRUNK System Link	Amps #	Amps Cost	Trunk 1000'	Trunk Cost	Total Cost
Trumann-Harrisburg	27.5	$44,728	104.16	$94,149	$138,877
Harrisburg-Waldenburg	18	29,277	65.14	58,821	88,098
Waldenburg-Weiner	5	8,133	18.00	16,270	24,403
Waldenburg-Fisher	7	11,386	24.00	21,693	33,079
Trumann-Marked Tree	24.5	39,849	76.00	68,695	108,544
Marked Tree-Tyronza	5.5	8,945	22.80	20,608	29,553
Marked Tree-LePanto	13.5	21,957	49.90	45,104	67,061
TOTAL	101.0	$164,275	360.00	$325,340	$489,615

Figures include capital costs only, excluding cost of tuning.

We have elected to use supertrunk cable (1.00" diameter coax.) instead of microwave for the interconnection of the 8 towns on the county cable system. This was done because it provides greater current channel capacity and greater future flexibility at a lower cost.

The optimal microwave interconnection network for the system we propose would have been a round robin system with seven transmitting/receiving stations, each with an 18-channel unidirectional capacity. The minimum cost for each station in this network would have been at least $130,499, excluding the cost of the towers, antennas, installation, and cable connections.

This is derived from the following components which would be required at each site:

AML MTX 132-3 3-rack Transmitter	$ 45,584
21 AML MTX 132 CM Channel Modules	71,610
AML TMIS Transmitter Monitor	3,960
AML LNBBR-231 Receiver	9,295
TOTAL	$130,449

As can be seen by comparison with the table above, this is only $8000 less than the cost of the most expensive cable link. In addition to providing greater immediate channel capacity (up to 27 forward and 3.5 reverse) the cable links are more easily maintained and allow for future expansion of the public system into the rural areas of the county by tapping distribution trunk and feeder into the supertrunk connecting links.